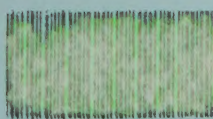


RI-546
255

ROHDE & SCHWARZ



MP MASTER



MA22275

Übersetzung von
nach R 17543

Zusammengestellt
nach R 17645

Printed in Western Germany

Instruction Book

UHF SIGNAL GENERATOR

Type SMAI BN 414202

Valid for BA-No. 801-9687 Z

R 17520 Bl.1

Supply of Replacements

Replacements are supplied on request by your nearest R&S agents or the principals ROHDE & SCHWARZ, D 8000 München 80, Mühldorfstraße 15; telephone (0811) 401981; telex 05-23703; telegram rohdeschwarz muenchen.

In your own interests, please let us have the following specifications when ordering replacements:

- (a) Reference Number and R&S Stock Number of the defective component (according to parts list).
- (b) Type or Order Number (BN) and Serial Number (FNr.) of the equipment (e. g. according to front-panel engravings).

Please specify the exact address in order to avoid unnecessary delays in delivery.

"Zusammenstell-Vorschrift"

The "Zusammenstell-Vorschrift" is a reference list specifying the different parts of the instruction book. With the aid of this list (ZV), it is possible to check up on the latest amendment (ÄZ) of the parts lists, circuit diagrams and drawings, and to find out whether all specified parts are in fact included in the instruction book.

Sections that are missing in the instruction book but listed in the "Zusammenstell-Vorschrift" were either not available when the instruction book was compiled or have been omitted unintentionally. Please inform us in this case, indicating the reference number (R-Nr.) of the list in the lower right-hand corner and the item number (Pos. -Nr.).

2. Title of the document

The document is a report on the results of the research conducted by the author in the field of the study of the development of the human mind.

The research was conducted in the field of the study of the development of the human mind, and the results of the research are presented in the following sections.

The research was conducted in the field of the study of the development of the human mind, and the results of the research are presented in the following sections.

The research was conducted in the field of the study of the development of the human mind, and the results of the research are presented in the following sections.

The research was conducted in the field of the study of the development of the human mind, and the results of the research are presented in the following sections.

3. Summary of the document

The document is a report on the results of the research conducted by the author in the field of the study of the development of the human mind. The research was conducted in the field of the study of the development of the human mind, and the results of the research are presented in the following sections.

The research was conducted in the field of the study of the development of the human mind, and the results of the research are presented in the following sections. The research was conducted in the field of the study of the development of the human mind, and the results of the research are presented in the following sections.

Table of Contents

<u>1.</u>	<u>Characteristics</u>	4
1.1	Uses	4
1.1.1	Measuring the Sensitivity of Receivers	4
1.1.2	Measuring the Dynamic Range and the Limiting Characteristic of Receivers	7
1.1.3	Measurements on Radar Receivers	7
1.1.4	Measurements on Narrow-band Resonant Circuits	9
1.1.5	Attenuation Measurements at Fixed Frequencies and with Automatic Frequency Sweep	10
1.1.6	Measuring the Gain and Directional Pattern of Antennas	12
1.1.7	Use as a Signal Source for Impedance Meters	13
1.2	Specifications	15
1.3	Accessories Supplied	19
1.4	Recommended Extras	20
<u>2.</u>	<u>Preparation for Use and Operation</u>	21
2.1	Front and Rear Panels	21
2.2	Switching On	26
2.3	Setting the Frequency	26
2.4	Setting and Indication of the Output Power	27
2.5	Selecting the PM Mode	31
2.6	Selecting the FM Mode	32
2.7	Adjustments of the Modulation Unit	34
2.8	Connecting the Test Item	36
2.9	Using the Frequency-linear Shaft	37
2.10	Synchronizing the Signal Generator with a Crystal Standard	37
2.11	Setting the ALC	39
2.12	Amplitude Modulation	41
<u>3.</u>	<u>Maintenance and Repair</u>	42
3.1	Circuit Description	42
3.1.1	Oscillator	42

1. Introduction	1
2. Objectives of the Study	2
3. Methodology	3
4. Results and Discussion	4
5. Conclusion	5
6. References	6
7. Appendix	7
8. Glossary	8
9. Index	9
10. Acknowledgements	10
11. Declaration of Interest	11
12. Statement of Originality	12
13. Certificate of Approval	13
14. Certificate of Publication	14
15. Certificate of Deposit	15
16. Certificate of Copyright	16
17. Certificate of Registration	17
18. Certificate of Filing	18
19. Certificate of Issuance	19
20. Certificate of Distribution	20

21. Certificate of Archiving	21
22. Certificate of Preservation	22
23. Certificate of Access	23
24. Certificate of Use	24
25. Certificate of Reproduction	25
26. Certificate of Translation	26
27. Certificate of Adaptation	27
28. Certificate of Derivation	28
29. Certificate of Collaboration	29
30. Certificate of Contribution	30
31. Certificate of Participation	31
32. Certificate of Involvement	32
33. Certificate of Engagement	33
34. Certificate of Interaction	34
35. Certificate of Communication	35

36. Certificate of Information	36
37. Certificate of Knowledge	37
38. Certificate of Understanding	38
39. Certificate of Awareness	39
40. Certificate of Recognition	40
41. Certificate of Appreciation	41
42. Certificate of Gratitude	42
43. Certificate of Respect	43
44. Certificate of Honor	44
45. Certificate of Dignity	45

3.1.2	Pulse Modulation Stage	44
3.1.3	Frequency Modulation Stage	45
3.1.4	1-kHz Oscillator	47
3.1.5	Power Indication	48
3.1.6	Automatic Level Control (ALC amplifier with BN 414202 only)	49
3.1.7	300-V Stabilizing Circuit	52
3.1.8	4-to-18-V Stabilizing Circuit	53
3.1.9	6.3-V-Stabilizing Circuit	55
3.1.10	50-to-460-V Stabilizing Circuit	55
3.1.11	20-V, 23-V, 35-V Stabilizing Circuits	58
3.1.12	Modulation Unit	58
3.2	Repair	61
3.2.1	Checking the Operating Voltages	61
3.2.2	Replacing the Klystron	63
3.2.3	Adjusting the Grid Voltage	64
3.2.4	Frequency Adjustment	64
3.2.4.1	Setting the Reflector Voltage	66
3.2.4.2	Setting the Frequency	66
3.2.5	Adjusting the 1-kHz Oscillator	67
3.2.6	Zeroing and Calibration of the Power Indication	67
3.2.7	Setting the Schmitt Trigger	68
3.2.8	Replacing the Indicator Lamps	69
Translations for Figs. 1 to 31		70
Figs. 1 to 31		
Supplement to Instruction Book		80
Supplement to Standard Translations for Parts Lists		81
Translations for Drawings and Diagrams		82
Parts Lists		
Drawings and Diagrams		

1.1	Introduction
1.2	Objectives of the Study
1.3	Scope of the Study
1.4	Methodology
1.5	Organization of the Report
2.1	Background Information
2.2	Statement of the Problem
2.3	Research Objectives
2.4	Research Questions
2.5	Significance of the Study
2.6	Delimitations of the Study
2.7	Definition of Terms
2.8	Summary
3.1	Review of Related Literature
3.2	Theoretical Framework
3.3	Conceptual Framework
3.4	Research Hypotheses
3.5	Operationalization of Variables
3.6	Measurement of Variables
3.7	Sampling and Data Collection
3.8	Data Analysis
3.9	Results and Discussion
3.10	Conclusion
3.11	Recommendations
3.12	References
3.13	Appendices
3.14	Index

4.1	Introduction
4.2	Objectives of the Study
4.3	Scope of the Study
4.4	Methodology
4.5	Organization of the Report
4.6	Background Information
4.7	Statement of the Problem
4.8	Research Objectives
4.9	Research Questions
4.10	Significance of the Study
4.11	Delimitations of the Study
4.12	Definition of Terms
4.13	Summary
4.14	Review of Related Literature
4.15	Theoretical Framework
4.16	Conceptual Framework
4.17	Research Hypotheses
4.18	Operationalization of Variables
4.19	Measurement of Variables
4.20	Sampling and Data Collection
4.21	Data Analysis
4.22	Results and Discussion
4.23	Conclusion
4.24	Recommendations
4.25	References
4.26	Appendices
4.27	Index

1. Characteristics

1.1 Uses

1.1.1 Measuring the Sensitivity of Receivers

The Signal Generator Type SMAI BN 41420 has its essential area of application in the measuring and monitoring of the sensitivity of receivers.

The use of a signal generator or noise generator for this purpose is particularly advantageous when the value of sensitivity expected is not yet established, the receiver still being in the development stage or the fault being sought in a defective receiver.

To determine the noise figure, the signal generator is connected to the input of the receiver with a generator output power 0 (PM switch in the position STANDBY) and the deflection α_1 is read at the output of the receiver. A square-law indicator should be used for this. This may be either a power meter connected to the intermediate frequency output or, after rectification of the IF in the square-law range of a diode characteristics, a meter or an oscilloscope. A block diagram of the test set-up is shown in Fig. 1.

If an output of magnitude P_a is applied by the signal generator to the input of the receiver, a deflection α_2 is produced.

The noise figure of the receiver is then

$$F = \frac{P_a}{k \times T_o \times B_e} \times \frac{\alpha_1}{\alpha_2 - \alpha_1}$$

where P_a = available output power of the signal generator (in W)

k = Boltzmann's constant 1.38×10^{-23} Wsec/ $^{\circ}$ K

T_o = the absolute temperature in $^{\circ}$ K

B_e = effective noise bandwidth of the receiver in Hz.

According to the definition of the noise figure, it is not necessary to know the actual power applied to the receiver being tested, but rather the available power, e.g. the power which is generated when the generator is match-terminated.

The output power reading and the attenuator calibration of the SMAI Signal Generator relate to the available power, so that, after attenuator calibration, the power P_a can be quickly determined in dBm.

F is a dimensionless number which gives the ratio of the noise power at the output of the receiver to the noise power that would be present if the receiver were noise-free. It is also customary to give the noise factor in dB; we have then:

$$F \text{ (dB)} = 10 \times \log F$$

In order to determine the noise figure we must know the effective noise bandwidth of the receiver. As a first approximation the 3-dB bandwidth can also be used. If the 3-dB bandwidth is used for the sake of simplicity, the maximum error is 10% in multi-stage receivers. The exact value of the effective bandwidth B_E in Hz is calculated from:

$$B_E = \frac{1}{g_0} \int_0^{\infty} g(f) df$$

where $g(f)$ = the power gain of the amplifier in dB as a function of frequency

and g_0 = the maximum power gain in dB.

Evaluation generally is carried out according to a graphic integration method. In the case of bandwidths of the order of several MHz, the incremental frequency control of the SMAI can be used for the plotting of the pass-band curve.

The determination of the noise figure of the receiver can be simplified by selecting a signal-generator level at which $\alpha_2 = 2 \times \alpha_1$. The formula is then

$$F = \frac{1}{k \times T_0 \times B_E} P_a \quad (\text{for } \alpha_2 = 2 \alpha_1)$$

or

$$F \text{ [dB]} = 173.93 + P_a \text{ [dBm]} - 10 \times \log B_E$$

For this case the noise figure of the receiver in dB can be directly obtained from the output P_a and the bandwidth B_E on the diagram of Fig. 2.

In addition to this method of measuring in which the signal generator operates in the CW mode, the tangential sensitivity can be measured with pulse modulation. The signal generator is modulated either internally with 1-kHz square-wave pulses, by means of the built-in modulation unit with adjustable pulses or externally.

When testing radar receivers which have a built-in pulse-generator stage, this can be used for the external triggering of the modulation unit. The IF output voltage after rectification is read on the display of an oscilloscope. The output level of the signal generator is so adjusted that the noise level is equal to the signal level, i.e.

$$\alpha_2 = 2 \times \alpha_1.$$

In this case the simplified evaluation for F and the diagram of Fig. 2 can be used. The triggering levels are read in pulse operation on the output attenuator calibrated in dBm.

Besides sensitivity measurements on receivers, noise figures in individual sub-units such as mixers or amplifiers can be determined with the methods discussed.

The automatic level control of the SMAI (with BN 414202) is particularly advantageous when the sensitivity or noise figure is to be determined of tunable receivers or broadband test items. It eliminates the need for recalibration and readjustment of the power output after each change of frequency. The output remains constant during frequency changes so that direct information with respect to the frequency response can be obtained from the variation of the output amplitude of the test item.

1.1.2 Measuring the Dynamic Range and the Limiting Characteristics of Receivers

When measuring the dynamic range, the linearity and the characteristics of logarithmation circuits in the amplifier stages of receivers, the input power to the receiver must be varied over a wide range, and the available input power should be exactly known at all times. This possibility is provided by the output attenuator of the SMAI, which directly reads the output power in dBm. The output is indicated via a directional coupler, so that even when the input impedance of the receiver varies as a function of the modulation level, no errors occur in the output indication.

In the measurement of limiting characteristics the amplitude modulation of the SMAI is particularly advantageous (only with BN 414202), permitting the signal generator amplitude to be varied by 15 dB, corresponding to the maximum modulation depth of 70%, by an external modulation signal. For this purpose a signal of $2 V_{pp}$ (sine, saw-tooth or other pulse forms) should be applied at the AM input of the signal generator. By changing the amplitude of the input signal, the modulation depth can be influenced correspondingly, using, for example, RC Generator Type SRM BN 4085, or Type SAT BN 4083. The output amplitude of the receiver is read on the display of an oscilloscope, connected to a video output or an IF output with rectifier stage.

1.1.3 Measurements on Radar Receivers

Owing to the favourable pulse-modulation properties of the SMAI, a series of measurements necessary for development and testing as well as for servicing and repairs can be made on radar receivers.

With the built-in Modulation Unit BN 414221 it is possible to adjust all pulse repetition frequencies and pulse widths, so that the original pulse of the radar transmitter can be simulated.

In addition to measuring the sensitivity of the receiver and the dynamic range (see sections 1.1.1 and 1.1.2), the exact frequency of the

receiver oscillator can be checked with the SMAI, by driving the receiver with the output of the SMAI instead of with the reflected pulse. The signal generator should be set to the same frequency as that of the transmitter oscillator of the radar set. The amplified pulse at the video output of the receiver is checked on the display of an oscilloscope. The modulation unit of the SMAI can be used for external triggering of the oscilloscope. Reflected pulses can be simulated with the SMAI for the calibration and checking of the radar indication. The delay stage provided in the modulation unit is used for this purpose. It permits any required travel time of the reflected pulse and thus any required distance to be simulated by means of the switch-selected delay of the transmitted pulse. By means of the external trigger input the transmitted pulse is synchronized with the pulses of the pulse generator of the radar set. The simulated distance is then the path length covered in half the delay time. It can be adjusted between 15 m and 150 km by varying the delay time.

The signal generator can also be used to simulate the effect of jamming transmitters on the display. Since pulse modulation and frequency modulation can be carried out simultaneously, measurements are possible on pulse-modulated Doppler radars and various motions can be simulated. High demands are here made on the frequency stability and residual FM of the signal generator. With a residual FM of $> 1.5 \text{ kHz}$ over the entire frequency range, the SMAI Signal Generator can also be used for tests of this kind. The residual FM is largely caused by the first and higher harmonics of the AC supply frequency, while the components of higher frequency are much weaker, so that the frequency spectrum diminishes rapidly on either side of the carrier.

For checking and measuring Doppler radar systems the reflection of mobile targets can be simulated by amplitude modulation (with BN 414202). The Doppler frequency produced by the movement of the target is simulated by an AF signal fed in at the AM input. This amplitude modulation can be effected at the same time as the pulse modulation of the signal generator. The Doppler frequency occurring under normal circumstances in the IF channel can thus be simulated for checking the indication of moving targets.

1.1.4 Measurements on Narrow-band Resonant Circuits

Measurements, such as examining resonators of extremely high Q or such as occur in microwave spectroscopy, impose such severe requirements on the generator as regards its frequency accuracy, its stability or the spectral purity of the signals as could never be met by a free-running oscillator.

Type SMAI can be synchronized with a crystal oscillator via its frequency control input. The necessary set-up is shown in Fig. 3, the required adjustments for synchronization are described in section 2.10.

The obtainable frequency accuracy of the synchronized signal is better than 5×10^{-9} , the unwanted frequency deviation being only a few Hz. These characteristics allow the UHF Signal Generator Type SMAI to be used for measurements on Doppler radar systems and narrow-band AM or FM transmissions over radio links.

With the aid of the synchronization device frequency modulation is also possible with synchronized operation, when the reference oscillator in the synchronization unit is frequency-modulated by small amounts. This kind of frequency modulation offers a linear modulation characteristic with a small unwanted frequency deviation and a transmitter output signal of high stability. The necessary set-up is shown in Fig. 4.

1.1.5 Attenuation Measurements at Fixed Frequencies and with Automatic Frequency Sweep

Accurate attenuation measurements are possible on many test items with the aid of the very accurate output attenuator of Type SMAI. As both, large and small attenuation values, can be exactly determined, it is possible for example to examine pass- and stop-band characteristics of filters.

The signal generator is also suitable for the checking of directional couplers, attenuator pads, unidirectional transmission lines, coaxial cables and waveguides.

Since the generator output presents an accurately known source impedance it is not necessary to connect an attenuator pad for matching. Only in measurements of very high accuracy in which the error of the output impedance ($VSWR < 1.5$) may have an adverse effect, the connection of an attenuator pad is recommended. The test set-up necessary for attenuation measurements is shown in Fig. 5 and Fig. 6. The attenuation can be read on the attenuator scale of the signal generator. The scale can be set to a round value by means of the knurled disc to simplify calculation. The meter following the test item (power meter, receiver or diode probe with 1-kHz indication amplifier) only acts as a constant output power indicator.

Owing to the stable 1-kHz modulation of the generator it is possible by simple means to measure high attenuation levels, using a very narrow-band and sensitive 1-kHz indication system. In case the modulation frequency of the generator does not accurately agree with the received frequency of the detector amplifier, adjustment is possible (see section 3.2.5).

The maximum attenuation which can be measured with a test set-up using the VSWR/Null Indicator Type UBK BN 12120 is 70 dB, when using a receiver set-up (Type USVB BN 15241) it is 77 dB.

With the ALC-equipped version of the SMAI (BN 414202), attenuation measurements can be carried out with manual or automatic tuning through the entire frequency range of the generator. Suitable test set-ups are shown in Fig. 7 and Fig. 8.

By means of the coupling unit on the frequency linear shaft, a recorder (Type ZSG BN 18532) or an external motor drive can be coupled to the frequency sweep of the generator. The torque available is 1500 cmg_f. In the first case the frequency is set manually. The power taken off at the output of the test item can be rectified with a diode probe or indicated on a power meter. The DC output voltage of the diode probe or of the power meter drives the Y-deflection of the recorder after amplification (with the Millivoltmeter Type UVG BN 12061).

Since the power output of the generator and therefore the power input of the test item is kept constant, the amplitude shown on the recorder trace is inversely proportional to the attenuation of the test item. When a diode probe is used for the display, care should be taken that the input level remains low enough to allow operation of the diode in the square-law section of the characteristic. In this range the DC output voltage is directly proportional to the power input. This method can save time particularly in series of measurements on high-pass and low-pass filters, since a plot of attenuation is produced immediately and can be used as a test certificate.

In order to increase accuracy, reference values can be marked in the plot by writing a 0-dB line without test item or by recording calibration lines by means of interconnected fixed attenuator pads, for comparison with the plot of the test item.

Reflection measurements are also possible according to this principle. A directional coupler is then used in the reverse direction, its input being connected to the test item. The test set-up is shown in Fig. 9.

The voltage recorded by the recorder is proportional to the reflection of the test item. By short-circuiting the test circuit or inserting fixed attenuator pads calibration lines can be written.

If, instead of the manual tuning, automatic frequency sweep is required, a motor drive can be coupled to the frequency linear shaft. The necessary torque is 3000 cmg_f with the brake released. The recorder is then also driven by the motor. A synchronous motor is best used for driving, in order to ensure a uniform frequency sweep. Mechanical coupling to the recorder is then not necessary, since the recorder has a synchronous motor for its own drive which ensures synchronization of generator and recorder.

1.1.6 Measuring the Gain and Directional Pattern of Antennas

In addition to the input impedance, the gain and directional pattern are important antenna parameters.

Since an antenna of standard design represents a reciprocal element, it can be used for transmission and reception in the measurement. The gain measurement is an absolute measurement, while a relative measurement is sufficient to determine the directional pattern. The antenna to be tested is mounted on a rotating stand and preferably used as receiving antenna, while the distant station may be fixed.

For the measurements the receiving antenna must be located in a homogeneous distant field. The distance l between two parabolic antennas must be:

$$l \geq \frac{2 (D_1^2 + D_2^2)}{\lambda}$$

where l - distance between the antennas in metres

λ - wavelength in metres

D_1 and D_2 - extension of the antenna in metres.

The frequency can be changed easily by remote control of the generator via the shaft brought out at the side, with frequency-proportional rotation speed. An appropriate set-up for remote control by means of a bridge circuit is shown in Fig. 10. With this set-up a tuning error of less than 1 MHz can be maintained. The power output of the generator can also be remote-controlled via a similar arrangement. According to the line diameter used, distances of up to 10 km can be covered with this type of bridge. Higher precision can be obtained using a synchro system for control.

The measurement of the directional pattern can also be carried out automatically, by rotating the antenna to be tested by means of a motor with constant angular velocity and recording the test results with a recorder. Fig. 11 shows the block diagram of a suitable test set-up.

A test receiver, e.g. Type USVB, BN 15241, is used for the indication of the signal received. An aperiodic arrangement with a diode probe and a 1-kHz amplifier (e.g. Type UBK BN 12120), can be used instead if the generator is internally pulse-modulated with 1 kHz. Very narrow-band and sensitive indication systems can then be used owing to the high stability of the modulation generator. If the indication amplifier or the receiver used does not have a sufficient dynamic range, the measurements can also be carried out by varying the output power of the generator; the indication amplifier is then used as an indicator and the output power of the generator can be read in dBm on the output attenuator.

In the case of remote-controlled measurements, the automatic level control of the generator is advantageous since the output power need not be corrected when the frequency changes.

1.1.7 Use as a Signal Source for Impedance Meters

Owing to its wide frequency range, the SMAI is very suitable for checking the impedance of wide-band test items. Its high amplitude and frequency stability permit the accurate determination of very small reflections in matching measurements, small half-amplitude widths in node-shift measurements, and of the phase angle of the impedance.

Here again the choice exists between selective measurements using a receiver and aperiodic measurements using a 1-kHz amplifier/null detector. The high stability of the modulation frequency permits the use of a very narrow-band, i.e. sensitive indicating amplifier. The test probe of a standing wave detector can thus be coupled so loosely that the test results are not distorted.

The reflection coefficient of a test item can be readily determined using a directional coupler for impedance measurements. This method of course does not provide any information on the phase of the reflection coefficient.

The Reflectometer Type ZLP BN 35691/.. with 50 Ω or 60 Ω characteristic impedance can be used in the frequency range of the SMAI.

By using the generator model equipped with ALC, such reflection measurements can be substantially simplified. When the frequency is changed or when the generator is tuned through the whole frequency range of the directional coupler, a rapid picture can be obtained of the reflection pattern. A single calibration at 100% reflection with the output of the directional coupler short-circuited is sufficient, since the power supplied by the generator remains constant. Fig. 9 shows a test set-up for automatic reflection measurements.

1.2 Specifications

<u>Frequency range</u>	500 to 1800 GHz
<u>Frequency setting</u>	frequency linear single-knob tuning, one band
<u>Frequency indication</u>	frequency selected is read on digital counter
<u>Error limits of frequency indication</u>	$\pm 0.5\%$
<u>Scale resolution</u>	100 kHz/div. (approx. 1.5 mm)
<u>Resetting error</u>	$\leq 1.5 \times 10^{-4}$
<u>Frequency variation due to $\pm 10\%$ variation in AC supply voltage</u>	$\leq 1.5 \times 10^{-5}$
<u>Frequency drift with temperature change</u>	$\leq 7 \times 10^{-5}/^{\circ}\text{C}$
<u>Frequency variation due to the output attenuator</u>	$\leq 0.2\%$ between P_{max} and -10 dBm
<u>Residual FM</u>	≤ 1.5 kHz
<u>Frequency linear shaft for connecting recorder or control unit (accessible on side panel)</u>	3.5 revolutions for the entire frequency range (dimensions see Fig. 12)
<u>Output power</u>	≥ 10 dBm (10 mW)
<u>Power indication</u>	by meter and mechanical counter
<u>Outputs > -10 dBm</u>	indication of the available power output in dBm on calibrated meter
<u>Ranges of power indication</u>	-20 to -10/-12 to 0/-5 to +10/+2 to +20 dBm
<u>Error of power indication</u>	+1 dB at full-scale deflection (increasing to ± 2 dB on lower third of scale)
<u>Outputs < -10 dBm</u>	cutoff attenuator with mechanical counter directly calibrated in dBm

Attenuator range 0 to -130 dBm

Smallest readable
attenuator increment 0.1 dB

Attenuator errors from
-10 dBm to -130 dBm $\pm(0.1 \text{ dB} + 0.05 \text{ dB/1-dB step})$

Residual AM $\geq 60 \text{ dB}$

Amplitude variation at $\pm 10\%$
fluctuation of AC supply voltage . $\leq 0.02 \text{ dB}$

Output impedance 50Ω ; adaptable^{+) Dezifix A connector}

VSWR

with BN 41420 ≤ 1.5

with BN 414202 ≤ 1.65

ALC

(only with BN 414202)

Output power

P_{max} to -13 dBm -13 dBm to -130 dBm

Residual fluctuation of
the stabilized amplitude $\leq \pm 1 \text{ dB}$ $\leq \pm 1.75 \text{ dB} +$
attenuator error

Residual AM with ALC $\geq 40 \text{ dB}$

Second RF output on rear panel for connection of a
synchronizer or frequency meter

Output power (uncalibrated) $\geq -10 \text{ dBm}$

Output impedance 50Ω ; adaptable^{+) Dezifix A connector}

RF leakage of generator

Field strength at
1 m distance $\leq 30 \mu\text{V/m}$

<sup>+) With the aid of screw-in assemblies the user can easily adapt
this connector to other systems; see data sheet 902100.</sup>

Modulation

PM INT. (square-wave modulation)

Repetition frequency 1000 Hz

Pulse width 0.5 msec

Accuracy of the repetition
frequency $\pm 0.5\%$

Rise time
at 500 to 890 MHz < 500 nsec
at 890 to 1800 MHz $\lesssim 100$ nsec

Fall time
at 500 to 890 MHz < 1 μ sec
at 890 to 1800 MHz $\lesssim 500$ nsec

PM EXT.

Repetition frequency 0 to 200 kHz

Pulse width 1.5 μ sec to 5 msec

Rise time
at 500 to 890 MHz < 500 nsec
at 890 to 1800 MHz $\lesssim 100$ nsec

Fall time
at 500 to 890 MHz < 1 μ sec
at 890 to 900 MHz $\lesssim 500$ nsec

Input voltage $\geq 2 V_{pp}$ (positive polarity)

Input impedance 150 Ω /1 W; BNC socket

FM EXT.

Modulation frequency range 1 Hz to 10 MHz

Adjustable frequency deviation
at 500 to 890 MHz 0 to > 100 kHz typical pattern
at 890 to 1800 MHz 0 to $\lesssim 400$ kHz see Fig. 13

Input requirement for max.
deviation $2 V_{pp}$

Input impedance 180 Ω ; BNC socket

AM EXT. (only with BN 414202)

Modulation frequency range 10 Hz to 100 kHz
Modulation depth 0 to > 70%
Input requirement 2 V_{pp} for max. modulation
percentage
Distortion
(at f = 1 kHz and 70% mod.) $\leq 5\%$
Input impedance 1 k Ω ; BNC socket

With Modulation Unit BN 414221

PM INT.

Repetition period 0.02 to 200 msec, adjustable
Pulse width 0.5 to 1000 μ sec, adjustable
Rise time
at 500 to 890 MHz < 500 nsec
at 890 to 1800 MHz ≤ 100 nsec
Fall time
at 500 to 890 MHz < 1 μ sec
at 890 to 1800 MHz ≤ 500 nsec
Synchronization delayed (0.1 to 1000 μ sec)
or undelayed

FM INT.

Type of modulation sawtooth
Modulation frequency 5 Hz to 50 kHz (0.02 to 200 msec)
Frequency deviation as for FM EXT.
Synchronization internal or external

Trigger output (BNC socket)

Polarity positive; delayed (0.1 to 1000 μ sec)
or undelayed
Amplitude ≥ 2 V_{pp}

Trigger inputs (BNC socket) two
 Polarity negative and positive
 Wave forms as required
 Amplitude 0.5 to 50 V_{pp}

Frequency synchronization

(Synchronization of the RF with crystal harmonic)

Tuning range $\frac{\Delta f}{f}$ 0.5×10^{-3}
 Required control voltage depending on voltage/frequency characteristic, max. 20 V
 Input impedance approx. 10 k Ω
 Input special socket FUN 10240

General data

Rated temperature range +10 to +35°C (shelf range -20 to +75°C)
 Power supply 115/125/220/235 V $\pm 10\%$,
 47 to 63 Hz (65 VA)
 Dimensions (W x H x D) 484 x 283 x 512 mm
 Weight 31 kg

Order designations

SMAI without Modulation Unit

Model without ALC UHF Signal Generator Type SMAI
 BN 41420

Model with ALC UHF Signal Generator Type SMAI
 BN 414202

Modulation Unit Modulation Unit for Signal
 Generators SMAI, SMBI, SMCI
 BN 414221

1.3 Accessories Supplied

1 power cord (approx. 2 m)
 1 Short-circuit Dezifix A (with BN 41420)
 1 Termination Dezifix A (with BN 414202)

1.4 Recommended Extras

Synchronizer Type XKG BN 444835

Frequency Synthesizer Type XUC BN 444467

Mixer & Harmonic Generator Type XME BN 444523

VSWR/Null Indicator Type UBK BN 12120

RC Oscillator Type SRB BN 40851

UHF Test Receiver Type USVB BN 15241

Log-periodic Antenna 450 to 2500 MHz BN 1500204

UHF Parabolic Antenna 0.9 to 6 GHz BN 150031
with plug-in radiators (with linear or circular
polarization)

Tripod for UHF Parabolic Antenna BN 150030

Patch Cord 50 Ω Dezifix A (70 cm) BN 9122015

Adapters:

Dezifix A $\longleftrightarrow$ Dezifix B	FNU 1020/50
Dezifix A $\longleftrightarrow$ N plug	FNU 16201
Dezifix A $\longleftrightarrow$ N socket	FNU 16301
Dezifix A $\longleftrightarrow$ C plug	FNU 16401
Dezifix A $\longleftrightarrow$ C socket	FNU 16501
Dezifix A $\longleftrightarrow$ 4.1/9.5 plug	FNU 13201
Dezifix A $\longleftrightarrow$ 4.1/9.5 socket	FNU 13301

For screw-in assemblies used in connector adaptation see data sheet 902100.

2. Preparation for Use and Operation

2.1 Front and Rear Panels

(see Figs. 14 and 15)

Ref.No.	Engraving	Function
<u>1</u>	AVAILABLE POWER	Knurled knob for adjustment of the available power from 0 to -130 dBm or > 1 to 1×10^{-13} mW; indication on <u>2</u> .
<u>2</u>	-dBm	Mechanical counter for digital indication of attenuation in the linear range of the output attenuator; adjustment with <u>1</u> .
<u>3</u>	ATT. CAL.	Knurled wheel for calibration of the attenuator; the readings of <u>1</u> and <u>4</u> can be brought to agreement.
<u>4</u>		Meter indicating the output power. Four ranges -20 to -10/-12 to 0/-5 to +10/+2 to +20 dBm can be selected with <u>5</u> .
<u>5</u>	RANGE (dBm)	Range selector for meter <u>4</u> .
<u>6</u>	ALC LEVEL/OFF	Knob for adjusting the level with ALC, provided only in model BN 414202; replaced by a dummy socket in BN 41420.
<u>7</u>	MHz	Counters for digital indication of the frequency set with <u>8</u> , in MHz

Ref.No.	Engraving	Function
<u>8</u>	FREQUENCY	Knob for frequency tuning (with flywheel drive); indication on counters <u>7</u> .
<u>9</u>	DRIVE FREE DRIVE BRAKED	Ring for switching on and off a friction brake, facilitating the fine frequency tuning; counterclockwise rotation releases the brake. When the ring is turned clockwise the drive is braked.
<u>10</u>		Shaft for the connection of a recorder. The hole is closed with a rubber plug (section 2.9).
<u>11</u>		Voltage indicator lamp
<u>12</u>	220 V T 0,8 B 115 V T 1,6 D	Power fuse
<u>13</u>		Power switch
<u>14</u>	RF OUTP. $R_1 = 50 \Omega$	RF output for the connection of a test item.
<u>15</u>	READY	Lamp, lights to indicate that the signal generator is ready to operate.
<u>16</u>	TRIGGER OUTPUT DELAYED	Output of Modulation Unit BN 414221; a delayed trigger pulse is available. The delay is 0.1 to 1000 μ sec, adjusted with <u>20</u> and <u>21</u> . The output can be switched on with <u>19</u> .
<u>17</u>	WIDTH (μ sec)	Switch for the adjustment of the pulse width in steps of 0.1 to 1000 μ sec; fine adjustment with <u>18</u> .

Ref.No.	Engraving	Function
<u>18</u>	WIDTH (μ sec)	Knob for the fine adjustment of the pulse width.
<u>19</u>	TRIGGER OUTPUT	Switch selecting the undelayed (left) or delayed (right) trigger pulse; output <u>22</u> or <u>16</u> is connected at the same time.
<u>20</u>	DELAY (μ sec)	Switch for the adjustment of the delay time in steps of 0.1/1/10/100 μ sec; fine adjustment with <u>21</u> . The delayed trigger pulse is available at output <u>16</u> .
<u>21</u>	DELAY (μ sec)	Knob for the fine adjustment of the delay in the range of 1 to 10 μ sec.
<u>22</u>	TRIGGER OUTPUT UNDELAYED	The undelayed trigger pulses are available at this output if switch <u>19</u> is at the left stop.
<u>23</u>	REP. PERIOD (msec)	Switch for the adjustment of the repetition period with the positions x0.1/x1/x10/x100 msec; fine adjustment with <u>24</u> .
<u>24</u>	REP. PERIOD (msec)	Knob for the fine adjustment of the repetition period in the range 0.2 to 2 msec.
<u>25</u>	TRIGGER INPUT POS./NEG.	Inputs for external trigger pulses.
<u>26</u>	EXT. MODULATION FM	Input socket for the external FM voltage.

Ref.No.	Engraving	Function
<u>27</u>	EXT. MODULATION AM	Input socket for the external AM voltage.
<u>28</u>	EXT. MODULATION PM	Input socket for the external PM voltage.
<u>29</u>	FM UNMOD. INT. EXT.	Function selector for frequency modulation with the positions: UNMOD. (no modulation voltage present) INT. (modulation with a sawtooth voltage from the Modulation Unit BN 414221) EXT. (external modulation voltage applied via <u>26</u>).
<u>30</u>	FM DEVIATION	Knob for the adjustment of the frequency deviation by varying the modulation voltage.
<u>31</u>	PM STANDBY CW 1 kHz INT. INT. EXT.	Function selector for pulse modulation with the positions: STANDBY (the RF power is cut off) CW (the signal generator delivers a continuous-wave signal) 1 kHz INT. (the output signal is modulated with a 1-kHz pulse) INT. (the modulation signal is taken from the Modulation Unit BN 414221) EXT. (the output signal is pulse- modulated by an external signal applied at <u>28</u>).
<u>32</u>	SYNC. INPUT	Input for the connection of a fre- quency synthesizer for the synchro- nization of the signal-generator frequency (section 2.10).

Ref.No.	Engraving	Function
<u>33</u>	AC SUPPLY	AC supply entrance
<u>34</u>	MOD. TEST	Socket for the connection of an oscilloscope for checking the modulation voltage.
<u>35</u>	S12 M 0,1 C	High-voltage fuse
<u>36</u>	RF OUTPUT	RF output with fixed output power.

2.2 Switching On

Before connecting the set to the AC supply, check whether the local AC supply voltage agrees with the voltage set on the instrument. The instrument is factory-adjusted to 220 V. It can be adapted to 115/125/220 and 235 V. For this purpose withdraw the set from its cabinet after loosening the four front-panel screws under the handles. Change the contact bar of the tapping panel on the transformer to the required AC voltage. For 220/235 V a slow-blow fuse of 0.8 A (M 0,8 B DIN 41571), for 115/125 V a slow-blow fuse of 1.6 A (M 1,6 B DIN 41571) should be used. Four spare fuses are supplied in a holder on the power transformer.

Connect the power cord to connector 33 on the rear panel and switch on with the power switch 12. The AC voltage indicator lamp 11 lights. It goes out if the power fuse blows.

The valve is allowed to warm up for about 50 sec, then the resonator voltage is switched on automatically. Readiness for operation is indicated by the READY lamp 15. In case of brief AC supply interruptions, another warm-up time is not necessary. The circuit design is such that the signal generator is ready to operate after return of the AC supply immediately or after a shortened warm-up time.

2.3 Setting the Frequency

The entire frequency range from 500 to 1800 MHz can be tuned in one band by turning the frequency tuning knob. When large changes in frequency are required, the friction brake can be disengaged by turning ring 9 behind the frequency tuning knob 8 anti-clockwise. By vigorously turning on the frequency tuning knob 8 the momentum can be utilized for frequency tuning.

The frequency setting is shown in MHz on the counters 7. The last counter also carries a scale with 100 kHz divisions. Accurately-known values can thus be read with fine tuning. When the required frequency has approximately been adjusted, fine tuning is best made with the

drive braked. Turn the brake ring 2 clockwise and make the fine tuning with the frequency tuning knob 8. The friction brake ensures that the frequency once adjusted is maintained.

When the signal generator is tuned, the reflector voltage required by the valve is also tuned and switched over automatically. Switching takes place at about 890 MHz. The switchover between different modes of the reflector voltage causes jumps in the output level, owing to the differences in the power gain of the different modes.

Slight jumps in output frequency may also occur. The tuning ranges overlap to permit fine tuning in the neighbourhood of a switching point. Thus the switching point is at a higher frequency when tuning towards higher frequencies than it is when tuning towards lower frequencies.

When high frequency stability is required, the signal generator should be allowed to warm up until thermal equilibrium is reached. The warming-up and therefore the frequency variation roughly follow an exponential function. For a permissible frequency drift of $5 \times 10^{-5}/15$ min a warm-up period of 2 hours is needed. When a poorer frequency stability is sufficient a correspondingly shorter warm-up time is adequate. The total change in frequency $\frac{\Delta f}{f}$ during the warm-up period is 8×10^{-4} .

2.4 Setting and Indication of the Output Power

With the knurled knob 1 the output power of the signal generator can be adjusted accurately from the maximum output > 10 dBm corresponding to > 10 mW, down to -130 dBm corresponding to 1×10^{-13} mW.

The piston attenuator used in the SMAI has a non-linear and a linear range, depending on the stroke of the attenuator. The non-linear range is effective when the probe juts out of the attenuator tube into the resonator. The linear range begins when the probe is withdrawn into the guide by a distance which is 0.4 times the diameter of the attenuator tube.

In the non-linear range the attenuation cannot be mathematically represented as a function of the stroke of the attenuator and, in addition, depends on the generator frequency. In the linear range the attenuation is proportional to the stroke of the attenuator; it can be accurately calculated and is almost independent of the frequency.

In the linear range of the output attenuator the attenuation is indicated by counter 2. The roller for the last digit carries a scale which permits the reading of attenuator steps as small as 0.1 dB.

Since the output attenuator only indicates relative values of attenuation, calibration in absolute values of the output is provided by means of the output level indicator 4. With the aid of this meter, outputs of more than -10 dBm (i.e. $> 100 \mu\text{W}$) can be measured directly. Output powers which are in the range $> -10 \text{ dBm}$ should always be measured with this output voltage indicator instead of using the attenuator indication. (With these outputs the probe of the output attenuator protrudes into the resonator, so that the attenuation is non-linear and the attenuator indication may show considerable errors.)

The measurement range of the indicator can be selected in the four steps -10/0/+10/+20 dBm by means of the range selector 5. A total range of 40 dB is thus covered.

The meter indicates in all operating modes the power available at the test item, since the indication system uses a directional coupler in the forward direction. Thus the indication is not dependent on the position, as it would be with simple probe or loop coupling of the indicator diode when the test item is mismatched. The indication corresponds to the power consumption of the test item if this is matched. If it is mismatched, the power consumption can be determined by taking the reflection coefficient into account, i.e. deducting the reflection loss from the output power of the generator. Fig. 16 and Fig. 17 show the reflection loss as a function of VSWR and reflection coefficient.

From an output of -10 dBm down to -130 dBm the output attenuator is linear and can be used for accurate power adjustments.

For absolute calibration of the output attenuator, set the range selector 5 to -10 dBm. Turn the knurled knob 1 AVAILABLE POWER so as to obtain an indication of the counter 2 of exactly -10 dBm. Then hold wheel 3 in position and adjust the meter reading also to -10 dBm (f.s.d.) by once more turning the knurled knob 1 AVAILABLE POWER. The calibration should be carried out at the required test frequency. When changing the frequency repeat the calibration. All outputs below -10 dBm can now be set on the output attenuator (knob 1) and accurately read on the counter.

The counter 2, the scale of the -10 dBm range of meter 4 and the corresponding position of the range selector 5 are engraved in blue colour.

The power measuring error results from the error of the power meter of ± 1 dB over the frequency range and the error of the output attenuator of $\pm(0.1 \text{ dB} + 0.005 \text{ dB per 1-dB step})$, dependent on the frequency. The first error component is constant, while the second error component consists of a constant term comprising the reading error plus the backlash and of a percentage term which expresses the actual error of the piston attenuator. The percentage error has a greater effect at low outputs.

A setting of -80 dBm, for example, contains the following error:

Indication error		± 1 dB
Attenuator error	Reading error, backlash	± 0.1 dB
	Percentage error of -10 dBm to -80 dBm $= 0.005 \times 70 \text{ dB}$	± 0.35 dB
Total error		± 1.45 dB

The indication on the meter and the counter is in dBm, i.e. dB referred to 1 mW. The output power in mW is obtained from

$$P [\text{mW}] = 1 \text{ mW} \times 10^{P [\text{dBm}]/10}$$

The output voltage of the generator into 50 Ω is calculated as follows:

$$E [V] = \sqrt{1 \text{ mW} \times 10^{P [\text{dBm}]/10} \times 50}$$

The sign of the output power in dBm is very important in this calculation. The relations between generator output power in dBm and watts and between generator output voltage in V and available output in dBm are shown in Fig. 18 and Fig. 19.

The calibration of the indication is only valid for CW operation. In modulated operation, the approximate mean value of the available power is indicated depending on the pulse duty factor of the modulation voltage. If an output calibration is required for modulated operation, this should be carried out in the CW mode, and only after the calibration should the operation be switched over to modulation. The calibration then relates to peak output power and can be converted by means of the pulse duty factor into mean output values.

The pulse duty factor is $\frac{t}{T}$, where t = pulse width and T = period of the modulation voltage.

The mean value of the available output power is then calculated as follows:

$$P_m [\text{dBm}] = P_p [\text{dBm}] - 10 \times \log \frac{T}{t}$$

2.5 Selecting the PM Mode

The PM mode of the generator is selected by means of the switch PM 31 with the positions STANDBY, CW, 1 kHz INT., INT. and EXT.

In the position STANDBY the valve is blocked by a negative grid potential and the RF power is cut off. This operating mode is particularly advantageous when checking the zero deflection of a connected power meter or the residual indication of an indicator system. After switching to another operating mode, the generator is immediately ready for operation and no new warm-up period for the valve is needed.

In the position CW all modulation signals are cut off from the valve and the generator emits a continuous-wave signal.

With the switch in position 1 kHz-INT. the output signal is pulse-modulated with 1 kHz. The pulse duty factor $\frac{t}{T}$ is 0.5. The stability of the modulation frequency is so high that even measurements with extremely narrow-band indicators are possible. The modulation percentage in all PM modes is 100%.

With the switch in position INT. the generator is pulse-modulated with a modulation signal supplied by the Modulation Unit BN 414221. See 2.7.

If the generator is ordered without Modulation Unit, a blank panel is provided instead. In this case no modulation is possible with the switch in position INT.

With the switch in the position EXT. the output power is pulse-modulated with a modulation signal fed to the input socket PM 28 . The valve is then blocked and is triggered with positive pulses.

A Schmitt trigger is provided in the modulator stage so that any required pulse form can be used for triggering. Input modulation voltages of $2 V_{pp}$ are required. The input impedance is 150 Ω . The connector is a BNC socket. If modulation voltages of any desired

curve form are fed to this input, such as sinewave, sawtooth, triangular or staircase pulses, the modulator stage is switched on or off whenever the trigger threshold is exceeded or the value falls below the threshold. The resulting pulse duty factor varies according to the waveform and the magnitude of the input voltage. The rise and fall times of the output pulse are only determined by the modulator stage or the oscillator valve. No demands are therefore made on the rise time of the triggering pulse. The maximum value reached by the pulse duty factor $\frac{t}{T}$ is 0.7. If the pulse width is further increased, uncertainties in switching will occur and defined RF pulses are no longer available.

If very exacting demands are made on the modulation properties and the maintenance of defined pulse data, the output pulses of the signal generator can be checked with the range selector 5 in the position MOD. TEST.

The output pulses rectified by the indicator diode are available at the socket MOD. TEST 35 on the rear side of the set and can be displayed on an oscilloscope. This possibility is particularly advantageous if the pulse width must be checked or the oscillation delay be balanced out.

If indication systems with synchronous rectification are to be used with internal 1-kHz modulation, a control pulse which is synchronous with the RF pulse can also be derived at this socket. This output has an impedance of 150 Ω and is equipped with a BNC socket. The output voltage depends on the setting of the output attenuator and is approximately 5 mV_{pp} at maximum output power.

2.6 Selecting the FM Mode

With the FM switch 29 , the FM modes UNMOD. INT. or EXT. can be selected.

In the position UNMOD. all modulation voltages are cut off from the valve and the modulation amplifier is out of operation. In this

position an unmodulated output voltage is available with the highest frequency stability.

The position INT. permits frequency modulation with a sawtooth voltage which is supplied by the Modulation Unit BN 414221.

If the generator is ordered without Modulation Unit, no modulation is available with the switch in this position.

The frequency deviation generated depends on the frequency setting of the signal generator. Fig. 13 shows the typical curve of the maximum obtainable frequency deviation. The deviation can be adjusted by variation of the modulation voltage using the red knob FM DEVIATION 30 .

The non-linearity of the modulation characteristic also depends on the frequency. With the values given in the data sheet for the maximum peak FM deviation, the error in linearity is $\leq 10\%$. If higher values of the peak deviation are possible in a generator, increased non-linearity of the modulation characteristic should be taken into account. Conversely, if the deviation is decreased, an improvement in linearity is obtained.

As a result of the variation of the reflector voltage a small modulation of the RF amplitude is produced simultaneously with the frequency modulation. With the value given in the data sheet for the maximum peak deviation, this has an amplitude modulation depth of $\leq 8\%$. If the frequency deviation is decreased, the modulation depth of the AM is reduced correspondingly.

The EXT. mode permits frequency modulation with modulation voltages of 1 Hz to 10 MHz applied to the FM socket 26 . Due to the built-in modulation amplifier which amplifies the applied modulation signal 10 times, an input voltage of $2 V_{pp}$ is sufficient to produce the maximum frequency deviation. The peak deviation can be set, as in the position INT., with the red knob FM DEVIATION. The diagram of Fig. 13 is also valid for the typical curve of peak deviation. The non-linearity of the modulation characteristic corresponds to that of the INT. mode. The connector is a BNC socket. The input impedance is 180 Ω .

The two separate modulation amplifiers and two independent mode selector switches permit simultaneous operation of the generator with pulse and frequency modulation. For example, the two modulation signals can be supplied externally or one of the two modulation signals from the Modulation Unit can be used.

2.7 Adjustments of the Modulation Unit

If the generator is ordered without the Modulation Unit BN 414221, a blank panel is supplied instead. Internal modulation is then not possible.

The Modulation Unit consists of three circuit groups which can be set independently from one another to adjust the repetition period, the delay and the pulse width. Fig. 20 shows the block diagram.

The repetition period is set by means of switch 23 (coarse) and potentiometer 24 (fine). The fine adjustment covers a range of 0.2 to 2 msec. The switch has the positions x0.1/x1/x10/x100; the repetition period set with the potentiometer must be multiplied by the factor indicated by the switch. The total adjustment thus covers a range of 0.02 to 200 msec.

The circuitry for setting the repetition period delivers a sawtooth voltage which is used for the frequency modulation of the signal generator when the FM mode switch 29 is in the position INT. The frequency of the sawtooth pulse is 5 Hz to 50 kHz corresponding to the inverse repetition period. In addition, this circuitry determines the repetition time of the pulses which are used for the internal pulse modulation of the signal generator. If the repetition-time stage is to be synchronized by external trigger pulses, the repetition period should be adjusted somewhat longer than the repetition time of the trigger pulses. Fig. 21 shows the pulse diagram. (For positive input pulses the diagram applies accordingly with reversed polarity)

The input impedance of the trigger inputs 25 is 100 k Ω ; the connectors are BNC sockets. As input stages Schmitt triggers are used, so that triggering can be obtained with any required pulse form of positive or negative polarity.

If the sawtooth signal delivered by the modulator is used for frequency modulation, note should be taken of the fact that the sawtooth fly-back released prematurely by the trigger pulse causes a decrease in the sawtooth amplitude. This decrease becomes more noticeable with increasing difference between the repetition time of the trigger pulse and the repetition time set on the Modulation Unit. The maximum sawtooth amplitude is reached when the repetition time in the Modulation Unit is set to a value that is only slightly higher than the period of the trigger pulse.

The delay time is set with switch 20 (coarse) and potentiometer 21 (fine). The potentiometer covers the range from 1 to 10 μ sec. The switch has the positions $\times 0.1/\times 1/\times 10/\times 100$; the delay time adjusted with the potentiometer must be multiplied by the factor indicated by the switch. The total range of adjustment thus covers 0.1 to 1000 μ sec.

At the input and output of the delay stage trigger pulses are available at the sockets TRIGGER OUTPUT UNDELAYED 22 and TRIGGER OUTPUT DELAYED 16. The following pulse-width stage is internally triggered by either of the two pulses. Either the undelayed or the delayed pulse can be selected for this purpose with the TRIGGER OUTPUT switch 19. This provides the following possibilities:

Switch 19 to the left: the pulse-width stage is triggered by the delayed pulse. The leading edge of the generator output pulse coincides with that of the delayed trigger pulse. Both lag behind the undelayed trigger pulse by the adjusted delay.

This position of the switch is suitable for displaying the rectified RF pulse on an oscilloscope, since the pulse can be brought to the centre of the screen by external triggering of the oscilloscope with the undelayed trigger output. It is also suitable for simulating echo pulses in testing radar receivers, where any required distance of the target can be simulated by adjusting the delay time.

Switch 19 to the right: The pulse-width stage is triggered by the undelayed pulse. The leading edge of the generator output pulse coincides with that of the undelayed trigger pulse. The delayed trigger pulse lags behind the signal-generator output pulses by the adjusted delay.

In this position of the switch the oscillation build-up delay of the generator, any delay in the RF channel or in a connected receiver, can be balanced out.

The switch thus permits the selection of leading or lagging trigger pulses with respect to the RF pulse. Regardless of the position of the switch, a trigger pulse which coincides with the start of the generator output pulse is always available.

The pulse width is set with the switch 17 (coarse) and potentiometer 18 (fine). The potentiometer covers a range of 1 to 10 μ sec. The switch has the positions x0.1/x1/x10/x100; the pulse width adjusted with the potentiometer must be multiplied by the factor indicated by the switch. The total range of adjustment thus covers 0.1 to 1000 μ sec.

With the PM mode selector 31 in the position INT. the signal generator is pulse-modulated with the pulses set on the Modulation Unit. The Modulation Unit is so designed that it can also be used in conjunction with the SHF Signal Generators Types SMI and SMC. The range of adjustment of the pulse width is therefore wider than can be utilized with the SMAI. The obtainable pulse widths are specified in section 1.2. If any particular pulse data, such as delay or pulse width must be obtained very precisely, the signal-generator output pulses can be checked at the socket MOD.-TEST 34.

2.8 Connecting the Test Item

The RF output 14 on the front panel is used for the connection of test item. It is equipped with a Dezifix A connector and can be adapted to suit other connector systems if required. See relevant data sheet 902110.

The signal generator has an output impedance of 50 Ω . No substantial power fluctuations will occur even with mismatch termination.

Suitable 50- Ω patch cords are available under the order number BN 911005.

An extra RF OUTPUT 36 is available on the rear panel of the set. The output power of this RF output is fixed and independent of the setting of the output attenuator. It is also independent of the load on the RF output 14.

In many tests, e.g. permanent, accurate monitoring of the signal-generator frequency at low output power of the front RF output or when synchronizing the generator with a crystal standard (see 2.10) this output is convenient to use since it eliminates the need for a T-junction or a directional coupler and insures good decoupling of the two outputs. The output impedance is also 50 Ω . The connector type is Dezifix A, which can be adapted if required. A short circuit FNZ 419 (for BN 41420) or a terminating resistor (for BN 414202) is supplied. These are used to prevent radiation of RF energy from the unused output 36. If ALC is used, the resistor also serves as a matched termination of the RF output 36.

2.9 Using the Frequency-linear Shaft

The signal generator is provided with a shaft 10 for mechanical coupling to a recorder, a motor drive or a remote control installation. The angular velocity of the shaft is directly proportional to the frequency. The shaft makes 3.5 revolutions when tuning through the entire frequency range. The direction of rotation is anti-clockwise for increasing frequency. The mechanical dimensions of the shaft coupling are shown in Fig. 12.

2.10 Synchronizing the Signal Generator with a Crystal Standard

When very exacting demands are made on frequency stability and spectral purity, the signal generator may be synchronized with a

crystal standard. The generator frequency is compared with a harmonic of the oscillation of a crystal standard and the voltage generated across a discriminator is used to tune the generator. The frequency drift can thus be reduced to 1×10^{-8} to 1×10^{-9} depending on the standard frequency source, and the residual FM can be brought down to a few Hz.

This control voltage is applied at the SYNCHR. INPUT 32 (Fig. 15). Since the tuning is carried out via the reflector of the klystron, the two contacts of this input are at reflector potential, i.e. at a maximum of 760 V to chassis. For this reason the special socket FUN 10240 is provided. When connecting synchronizing equipment, care should be taken that adequate insulation is present in the connecting lead and the synchronizing equipment. Fig. 3 shows a test set-up for synchronization of the signal generator. The Synchronizer Type XKG BN 444835 is connected via the special two-wire shielded cable BN 444835-70 which is supplied with it.

Either the crystal oscillator in the XKG (XKG in the position QUARZ INT.) is used as 10-MHz reference frequency for the Synchronizer or the 10-MHz signal is obtained from the Frequency Synthesizer Type XUC (accessible on rear panel of XUC).

The RF signal required for comparison against the standard frequency is supplied by the RF OUTPUT 36. The RF OUTPUT 14 is thus free for the connection of the test item so that the maximum and minimum voltages of the Mixer and Harmonic Generator Type XME need not be considered when setting the power at this output. The RF OUTPUT 36 supplies sufficient output power for the XME over the frequency range 1000 to 1800 MHz. Suitable mixing equipment is required instead of the XME for synchronizing between 500 and 1000 MHz.

With a given frequency required for the signal generator, the frequency of the frequency synthesizer should be so adjusted that the following condition is satisfied:

$$f(\text{XUC}) = \frac{f(\text{SMAI}) \pm 30 \text{ MHz}}{n}$$

where n may be any whole number.

When tuning the generator or the standard frequency a Lissajous figure is seen on the screen of the synchronizer if this condition is satisfied. According to the phase deviation, a circle or an ellipse is obtained which may also degenerate into a slanted straight line. (For further details see instruction book of the Synchronizer Type XKG.)

The electronic tuning of the reference oscillator in the Synchronizer permits frequency modulation with very good linearity of the modulation characteristic. Modulation signals up to a few kHz can be fed to the synchronizer. Fig. 4 shows the test set-up.

2.11 Setting the ALC (BN 414202 only)

With automatic level control the power level is set with the ALC knob 6. (In the version of the generator without ALC, BN 41420, a dummy socket is provided instead of the knob.) The built-in control circuit automatically equalizes fluctuations in the oscillator amplitude which may result from changes in frequency or load.

With the potentiometer knob at the right-hand stop - indicated by a black mark - the ALC is not operating; in this position the full non-attenuated oscillator amplitude is available if the maximum power of the generator is required. Since the residual amplitude modulation somewhat increases when the ALC is operating, this position of the potentiometer should also be used in tests where the full stability of the output amplitude is more important than ALC.

The power level is set according to two somewhat different methods for high and low output powers; see Fig. 22.

Stabilized output power > -13 dBm

Stabilized output powers of more than -13 dBm (i.e. $> 50 \mu\text{W}$ or 50 mV into 50Ω) are first set with the output attenuator 1

in such a way that the minimum delivered power is approx. 2 dB above the required level in the required frequency range. When measuring over the total frequency range of the signal generator, this minimum generally occurs after mode switching at 890 MHz.

In order to read the output power, set the range selector 5 of the meter 4 to the appropriate range. By rotating the ALC potentiometer 6 counterclockwise, the level can then be set to the required value. When altering the frequency of the signal generator or when varying the load, the variation in the output amplitude is now equalized within the accuracy specified; the specified error relates to the variation resulting from a change of frequency. The residual amplitude variation caused by a variation of load is ≤ 0.3 dB. By setting the output attenuator 1, the output amplitude can now no longer be varied, except that the output power is reduced to such a low value that the adjusted level of control is not reached.

Since the control acts via the meter amplifier, a change in position of the range selector 5 results in a corresponding alteration of the level or, with insufficient output power, in a failure of the ALC.

Stabilized output power < -13 dBm

With output powers of less than -13 dBm the level is insufficient for direct regulation. The output power at the RF OUTPUT 36 is then used for comparison and the attenuator in the RF OUTPUT 14 is controlled correspondingly, so that the power variations are reduced. The offset is here naturally greater; thus when an output power is required which is only slightly less than -13 dBm, it may be preferable to choose a higher power setting and to obtain the low level by inserting an attenuator.

When the output power is reduced switchover takes place at a given setting of the output attenuator 1 (corresponding to approx. -13 dBm) to ALC with the aid of the fixed RF OUTPUT 36. This output should then be terminated with the Precision Termination Type RMA supplied.

The level is set by adjusting the output power first to -13 dBm with the output attenuator 1 , with ALC not operating. The adjustment should be made at the frequency at which the power is a minimum in the required frequency range. The potentiometer should then be turned clockwise until the meter reads a clearly reduced level ($\Delta a > 2$ dB).

The indication of the output attenuator should now be calibrated by holding the knurled knob 1 and turning the wheel 3 , until the reading on the meter and the reading of the roller counter agree.

Any required output power down to -130 dBm can now be set with the output attenuator and read off the roller counter.

2.12 Amplitude Modulation

(with BN 414202 only)

The amplitude modulation is carried out with the circuitry provided for the automatic level control. The modulation signal is applied to the AM socket 27 . (The generator version without ALC is provided with a dummy socket in its place.)

The modulation signal is clamped at 100% carrier amplitude so that the full carrier amplitude is retained. The direction of modulation is negative, i.e. positive input amplitudes produce a decrease in carrier amplitude. Owing to the clamping circuit, the lowest modulation distortion is attained at the maximum modulation depth of > 70%. At low modulation depths or with a modulation frequency higher than 1 kHz an increase in distortion should be taken into account. For the maximum depth of modulation an input voltage of $2 V_{pp}$ is required. The modulation frequency range covers 10 Hz to 100 kHz.

3. Maintenance and Repair

3.1 Circuit Description

(see overall circuit diagrams 41420 S and 414202 S, the circuit diagrams of the subassemblies and Figs. 23, 24)

3.1.1 Oscillator

The Signal Generator Type SMAI is a single-stage generator equipped with a reflex klystron with tuned external circuit. In a klystron, the transit-time effect is used to control the electron beam.

The electron beam emitted by the cathode is velocity-modulated during its passage through the resonator gap (between g_2 and g_3). In the adjacent drift chamber the slower electrons are caught up by the faster electrons, so that at the end of the drift chamber a density modulation is produced. As a result of the negative potential at the reflector terminal of the valve, the density-modulated electron beam turns round in the drift chamber and passes a second time through the resonator gap.

By suitable selection of the reflector voltage, the path length in the drift chamber can be adjusted in such a way that the electron beams arrive at the resonator gap during the negative (electron-retarding) phase of the resonator AC, generated by self-excitation. This permits the extraction of energy from the focused electron beam and the supply of this energy to the resonator as electromagnetic energy.

The transit time in the drift chamber determined by the reflector voltage can have several values (reflector modes) which satisfy the following condition of self-excitation:

The transit time in the drift chamber must be:

$$\tau = (n + \frac{3}{4}) \times T$$

$n = 0, 1, 2, 3, 4.$

$T =$ period of the RF oscillation.

The necessary value of the reflector voltage therefore varies as a function of the frequency of the RF oscillation.

As resonator a coaxial line circuit is used whose length can be tuned by means of a capacitive shorting piston. It is tuned to $1/4$ of the wavelength of the frequency setting. The selective coupling of damped circuits ensures that no oscillation modes of higher order (e.g. $3/4-\lambda$ or $5/4-\lambda$ tuning) are able to occur in the resonator.

The frequency is tuned by moving the shorting piston over a spiral attached to a drum. The frequency response is linearized by the pitch of this spiral which varies over the tuning length. The spiral may be shifted at several points by means of adjusting screws, in order to adjust the frequency when replacing the klystron. The inner surfaces of the resonator are very smooth to obtain a good circuit Q and are silver-plated, as are the components of the piston.

The valve is inserted in two ring-shaped contacts at the end of the line resonator and is retained in position by a spring located in the socket.

When the generator is tuned, the correct setting is automatically obtained and the reflector voltage is suitably changed by means of a retransmitting potentiometer with several taps. This automatic reflector system has tuning possibilities which can also be used to equalize variations in valve quality when replacing the valve.

The whole of the tuning section of the oscillator and the automatic reflector system are enclosed in a cast housing. In addition to ruggedness and good dust sealing properties this also ensures low RF leakage of the generator. The required operating voltages are fed in via low-pass filters.

The RF power is derived via two opposite piston attenuators by means of which the output power can be varied and accurately-known attenuation values can be set.

A movable capacitive probe is provided in the piston attenuator facing the output of the signal generator. It is terminated by a 50-Ω disc-type resistor which constitutes the output impedance.

To avoid variation of the oscillator tuning with strong coupling of the attenuator probe, a cam-controlled loading pin is driven counter to the probe.

The distance of the opposite probe is fixed, that is, its attenuation cannot be varied. Being of the same construction as the other attenuator, its frequency response is the same as that of the output coupling of the test power.

The large-surface contacts at grids g2 and g3 and a heat-dissipating ring ensure that the heat produced by the klystron is eliminated at the outer conductor of the resonator, so that no special cooling system is required.

In order to prevent deposition of dust, the set is in a completely enclosed housing.

To reduce the residual modulation of the signal generator, the power transformer is shock-mounted so that mechanical vibrations cannot be transmitted.

3.1.2 Pulse Modulation Stage

(see circuit diagram 414220-1.90.20 S)

A Schmitt trigger is provided for the pulse modulation of the generator with which the control grid of the oscillator is frequency-shifted.

In order to obtain high modulation frequency limits, i.e. steep rise and trailing edges, harmful circuit capacitances in the grid circuit line must be avoided. For this reason the modulation stage is located directly at the socket of the klystron on the printed circuit board 41420-1.90.20. The complete circuit is at the cathode potential of

-300 V with respect to chassis (see block diagram Fig. 24). The Schmitt trigger contains the transistors T1104 and T1105. During pulse modulation, T1104 is blocked and T1105 is conductive. This is achieved by means of the appropriate setting of the potentiometer R1112. The oscillator valve grid which is connected to the collector of T1105 then has a negative potential with respect to the cathode and the valve is blocked. If positive pulses from the modulation input arrive at the base of T1104 via the preceding stages, this becomes conductive and in turn blocks T1105, so that the valve obtains a positive potential. Resonator current then flows through the valve and the oscillator operates. This condition lasts as long as the positive input pulse continues. When the input pulse decays the Schmitt trigger drops back to the rest position and the valve is once more blocked.

With the PM mode switch 31 in the position STANDBY the Schmitt trigger remains in the rest position and all modulation pulses are cut off.

With the switch in the position CW, the relay Rs1101 closes and bypasses the transistor T1104, so that T1105 is blocked. The klystron grid is then permanently at positive potential and the oscillator oscillates in the CW operating mode.

3.1.3 Frequency Modulation Stage (see circuit diagram 41422-1.76 S)

Frequency modulation is obtained by changing the voltage applied to the reflector electrode of the klystron.

This causes a corresponding variation in the output frequency of the oscillator within the electronic bandwidth. A rise in the negative reflector voltage then corresponds to a rise in frequency.

In order to keep the required modulation input voltage low ($< 2 V_{pp}$), a modulation amplifier is provided in the signal generator. The

complete amplifier circuit is accommodated on the printed circuit board 41422-1.76. It is located in the cast housing and can be withdrawn upwards after removing the cover and two screws. A separate voltage of 35 V is provided for the power supply of the amplifier; this voltage is at reflector potential. Care should therefore be taken when carrying out tests.

The modulation signal reaches the actual amplifier via C1201 and the transistors T1201, T1202 and T1203, which serve as impedance transformer. The diodes G1 1201 and G1 1202 protect the input transistors against inadmissably high voltage peaks when the set is switched on or off.

The amplifier consists of a differential amplifier (T1207 and T1208) and has two inputs. The inverting input at the base of T1207 provides the frequency modulation in conjunction with the preceding stages. When this input is used, a gain of $V = 10$ is obtained. The non-inverting input at the base of T1208 is DC coupled via the transistor T1209 and brought out at the rear of the set. Here a control voltage for the frequency synchronization of the signal generator can be applied. The gain is $V \approx 1$. The reflector terminal of the klystron is DC coupled to the output of the amplifier (collector of T1207).

In order to ensure high temperature stability of the output frequency the modulation amplifier is carefully stabilized, thus preventing drift of the operating point. In the CW mode, the modulation signal and also any spurious signals are cut off via the open relay contact rs1201, in order to provide good stability of the oscillator frequency.

By means of the potentiometers R1208 and R1218, the operating point of the differential amplifier and the symmetry of the dynamic range can be set. The stages T1204, T1205 and T1206 also serve for the stabilization of the operating point of the amplifier.

3.1.4 1-kHz Oscillator

(see circuit diagram 41420-53 S)

The set contains a 1-kHz oscillator for internal pulse modulation. It is located on the plug-in module 41420-53 in the circuit board cassette. This unit also delivers the switching pulses for the chopper-amplifier of the power indication. The transistor T201 operates as an LC oscillator in order to obtain high stability of the pulse repetition frequency. It oscillates with a frequency of 2 kHz, i.e. with a period of 0.5 msec. The sinewave output of the oscillator triggers a monovibrator which consists of the transistors T202, T203 and T204. The reset time is determined by the time constant R209 and C204, which generates symmetrical squarewave pulses with a pulsewidth of 0.25 msec. For further processing, these squarewave pulses are taken off at the collector of T202 and the emitter of T203, which are in antiphase. The pulses coupled out at the collector of T202 trigger a bistable multivibrator which consists of the transistors T205 and T206. Each negative edge of the trigger pulse switches the multivibrator from one stable position to the other. This halves the input frequency so that, at the output, pulse signals are available with a repetition frequency of 1 kHz and a pulse duty factor $\frac{\tau}{t} = 0.5$. These pulses at the output St201.7 and St201.9 are used for driving the chopper-amplifier.

The pulses for the modulation of the signal generator are impedance-matched in the stage T207 and then available at the output St201.3. For the synchronous rectification at the output of the chopper-amplifier, switching pulses are needed with a repetition frequency of 1 kHz, a pulse width of 0.25 msec and the correct phasing with respect to the switching pulses at the outputs St201.7 and St201.9. These pulses are generated by the two adder stages T208 and T209 by adding the 1-kHz and 2-kHz squarewave pulses. T208, for example, is without current only if both the emitter of T203 (2-kHz pulse) and the collector of T205 (1-kHz pulse) are at negative potential. Otherwise, collector current flows in T208 and holds the output St201.11 at negative potential. The same applies to T209 accordingly.

3.1.5 Power Indication

(see circuit diagram 41420-52 S)

A directional coupler in the output line couples out a small fraction of the incident RF power and rectifies this by means of a diode for the indication of the output power of the signal generator. The directional coupler is constructed as a transmission line coupler in tri-plate configuration and consists of two sections of different coupling attenuation with a length of $\lambda/4$. This provides linearization of the frequency response. The very low DC voltage present after rectification must be amplified in the chopper-amplifier to a level high enough to be read on the meter and to drive the ALC amplifier which controls the output power (only with BN 414202).

The whole chopper-amplifier is located in the plug-in printed board 41420-52. The DC present at input St101.13 is chopped into a square-wave voltage of identical amplitude in the switching stages T101 and T102. The switching stages are triggered in antiphase by means of 1-kHz pulses which are supplied by the 1-kHz oscillator 41420-53. With the aid of the potentiometers R102 and R103 connected in the gate lines of T101 and T102, the noise voltage indicated on the meter can be reduced to a minimum.

A pre-amplifier consisting of T103 and T104 is followed by the switching stage T105 which provides the range selection in the second range. In the first range the series-connected resistors R116 and R117 are bypassed by T105. When switching over to range 2 and all further ranges, a negative potential is applied to input St101.7 by S3/I, which causes T105 to become highly resistive; the series resistors then become active and reduce the gain. The sensitivity in range 2 is set by means of R117.

The following ranges are selected by means of an attenuator preceding the input of the chopper-amplifier. Range 1 is set by varying the negative feedback in the amplifier stages T106 to T111. These are followed by the synchronous rectifier consisting of T112 and T113. The amplified squarewave voltage is switched in phase with the

switching stages in such a manner that a DC voltage can be taken off at the output St101.2, which is proportional to the input voltage. The pulses switching the synchronous rectifier are also supplied by the 1-kHz oscillator 41420-53.

The synchronous rectification at the output of the chopper-amplifier is driven by pulses whose pulsewidth is only half that of the pulses with which the switching stages at the input are driven. This arrangement prevents voltage peaks generated by the input switching stages from adversely affecting the indication.

3.1.6 Automatic Level Control (ALC amplifier with BN 414202 only) (see circuit diagram 414222-20 S)

In the version of the signal generator without ALC (BN 41420) all terminals and mounting facilities are provided so that the set may readily be equipped with the ALC if required at a later date.

The circuitry needed for the ALC is shown in Fig. 22. This block diagram contains two possible control circuits which are alternatively operating at high and at low output powers. The control circuit for output powers greater than -13 dBm closes via the directional coupler 1 of the indication, the chopper-amplifier 1, the ALC amplifier and the final control element 1.

When the ALC operates, the variations in oscillator amplitude are balanced out by electronically varied attenuation of the final control element. All output amplitudes above a given, adjusted level are automatically attenuated in such a manner that a constant, frequency-independent RF level is available at the output.

The final control element consists of a 3-dB directional coupler which is terminated at two diagonal branches with PIN diodes. When two diagonal branches of a 3-dB directional coupler are terminated with their characteristic impedances, a high attenuation appears between the two other diagonal branches. When the two diagonal branches are short-circuited or provided with an open circuit (100% reflection) the coupler presents an insertion loss of approx. 0 dB.

The control element used in the SMAI is terminated with two PIN diodes, which in the RF range represent a substantially real, frequency-independent resistance whose value may be changed by a suitable control current in the diode. With this arrangement any attenuation between 0 dB and the maximum value of attenuation - approx. 20 to 25 dB - can be set by electronic means. The final control element is controlled by the ALC amplifier. This contains a differential amplifier which compares the DC voltage produced by rectification in the coupler of the indication and amplified in the chopper against a nominal voltage (for a description of the directional coupler of the indication and of the chopper-amplifier see section 3.1.5).

The whole circuit of the ALC amplifier together with the AM modulation amplifier is located on the plug-in circuit board 414222-20. The two differential inputs are at St2201.2 and St2201.6, the test voltage being fed to St2201.2 and the nominal voltage to St2201.6.

The differential amplifier consisting of transistors T2201 to T2204 is followed by the amplifiers T2208 and T2209, which drive the PIN diodes in the control elements. The differences between the two PIN diodes in one control element can be equalized by means of the potentiometers R2218 and R2219. The differences between control element 1 and control element 2 are equalized by means of R2220.

The stages T2206 and T2207 are provided for switching the ALC off. With the nominal-voltage potentiometer 6, which adjusts the level, at the right-hand stop, the base voltage of T2206 exceeds the emitter voltage (voltage divider R2207, R2208), the transistor becomes conductive and the entire ALC is switched off via T2205.

For output powers above -13 dBm, the variations of the oscillator amplitude in the particular frequency range are balanced out by a direct control circuit in which the output level can be set by varying the nominal voltage. Variations in the output power caused by variations in load or by a varying frequency response of the impedance of the connected test item are thus completely levelled out.

The setting of the range selector for the power indication, i.e. the sensitivity of the chopper amplifier, also affects the adjusted level, because this changes the input voltage of the ALC amplifier.

Output powers below -13 dBm are too low to supply the input voltage required by the ALC amplifier. In this case, a switch is operated which is controlled by the output attenuator and puts the second control circuit into operation. The power output is controlled via the RF OUTPUT 36, which has a fixed setting and maintains a sufficiently high level independent of the power taken off at the test output.

The control element in the test output is in this case controlled by the ALC amplifier, so that here again any variation in the oscillator amplitude is balanced out (see Fig. 22).

The second control circuit also contains a directional coupler for indication, a chopper amplifier and a control element, which are all identical to the elements of the first control circuit.

Thus the differences in frequency response and attenuation are very small as is necessary to achieve a sufficient regulation factor.

The circuit board of the ALC amplifier also accommodates the modulation amplifier for AM, which is connected to the output of the ALC amplifier. The modulation signal is fed to St2201.13. Amplificator and impedance transformer (with transistors T2215 and T2214) are followed by the first clamping circuit which clamps the modulation signal to chassis potential in order to permit only modulation in the direction of negative amplitudes. This clamping circuit is necessary because it is not possible to obtain symmetric modulation in AM via variable attenuation.

Another impedance transformation in the stages T2213 and T2212 is followed by a diode matrix at the emitter of T2212 which predistorts the modulation signal in such a way that linear modulation becomes possible together with the non-linear modulation characteristic of the control element.

In a second clamping circuit the modulation signal is again clamped at the same half-wave, amplified in the following stages T2211 and T2210 and fed as variable current to the PIN diodes of the control element. The modulation depth of 70% may be set with the potentiometer R2227.

3.1.7 300-V Stabilizing Circuit

(see circuit diagram 41420-50 S)

The stabilizing circuit producing the 300-V resonator voltage for the klystron is on the plug-in circuit board 41420-50.

After a warm-up period of about 50 sec the input voltage is applied to the input of the stabilizing circuit via contact rs1 (in 41421 S Bl. 2). The 6.3-V stabilizing circuit 41422-45 (see section 3.1.9) delays the response of relay Rs1.

Fuse Si2 in the input circuit of the 300-V stabilizing circuit (in 41421 S Bl. 2) also protects the other stabilizing circuits from overvoltage since apart from the 20-V stabilizing circuit all are taken to chassis via the 300-V stabilizing circuit. Fuse Si2 (medium-lag 0.1 A, M 0.1 C DIN 41571) is accessible at the rear panel of the set.

The 300-V stabilizing circuit consists of the series transistor T1001, the driver T1102 and the shunt amplifier T1003, T1004. Part of the output voltage is reduced by the voltage divider R1013 to R1015 and compared at transistor T1004 with the reference voltage produced by the Zener diodes G1 1007 to G1 1009. An increase in output voltage results in a reduced base current of T1004 and thus an increased collector-emitter voltage. The current through transistor T1003 and the voltage drop across resistors R1003 and R1002 increase.

At the same time the collector-emitter voltage of the series transistor T1001 increases and the output voltage decreases correspondingly.

If the output voltage drops the process is reversed. The series transistor T1001 is by-passed by the Zener diodes G1 1001 and G1 1002 to prevent the full input voltage from reaching the output in case of a short-circuit.

The output voltage is adjusted by means of R1014.

The resistor R1018 located in the negative path enables the resonator current to be measured by determining the voltage drop across this resistor. The fact that the shunt current of the stabilizing circuit also flows through this resistor and thus generates a voltage drop should here be taken into consideration. It can be measured with a voltmeter connected to the terminals 1 and 5 of the circuit board (J_{Res} test point). The second series resistor R1020 is used to control the resonator current. The stabilizing circuit on the circuit board 41422-43 employs the voltage drop produced between terminals 1 and 7 for the automatic equalization of current variations. The required resonator current can then be set with the potentiometer R1020.

3.1.8 4-to-18-V Stabilizing Circuit

(see circuit diagram 41422-43 S)

The stabilizing circuit for 4 to 18 V generates the positive grid voltage for the klystron. Two operating modes are possible by switchover of the relay Rs601. With the contact rs601 closed (by S4/III in position 1 kHz INT., INT. and EXT. of the PM switch) the stabilizing circuit generates a fixed output voltage, whose magnitude can be set with R605. The reference voltage is generated across the Zener diode G1 606 by means of a negative auxiliary voltage. The transistors T604 and T605 are cut off in this mode by the blocked diode G1 604.

The output voltage is controlled between the terminals St601.4+5 and St601.14 via the shunt amplifier T603 and the series transistor T601 with the driver stage T602.

With the contact rs601 open, the reference attenuator consisting of R605 to R608 is cut off and the diode G1 605 is blocked.

The negative voltage applied to the base of T604 via the control voltage input St601.8 is generated by the resonator current of the klystron valve as a voltage drop across a series resistor. (The resistor is connected between the terminals St601.4+5 and St601.8 and is located on the circuit board of the 300-V stabilizing circuit.) A decrease in resonator current results in a corresponding drop in this test voltage. This in turn results in an increase in the positive grid voltage at terminal St601.14 via the transistor T604 and the rest of the stabilizing circuit, which compensates for the original decrease in current to such an extent that the rated value is restored. As the klystron ages and the transconductance of the valve decreases, a constant output power is nevertheless available right up to the end of its service life.

The Zener diodes G1 602 and G1 603 prevent the output voltage from exceeding permissible values for the valve. The resonator voltage of 300 V is connected via a delay circuit and the resonator current flows with a corresponding delay. Stage T605 prevents a rise in the positive grid potential to the maximum value which may result from the resonator voltage being delayed. If no control voltage is present, T605 is without current and T604 is also blocked via the attenuator R615, R614, G1 607, R613, the output voltage is then a minimum. No current flows in T605 until a small control voltage is generated by the forward current of the 300-V stabilizing circuit; then the diode G1 607 is blocked and the stabilizing circuit functions.

The resonator current is set by varying the series resistor R1019 in the 300-V stabilizing circuit, through which the resonator current flows.

3.1.9 6.3-V Stabilizing Circuit

(see circuit diagram 41422-45 S)

The 6.3-V stabilizing circuit for the heater voltage of the klystron and the delay circuit for the switch-on delay of the resonator voltage are accommodated on circuit board 41422-45.

The 6.3-V stabilizing circuit consists of the shunt amplifier T803 and the series transistor T801 with driver T802. The output voltage can be set to the rated value using the resistor R804.

The delay circuit contains the field-effect transistor T805 and the following switching transistor T806, whose collector is connected to the relay. The delay time is determined by the charging time constant of capacitor C805 and resistor R808. If after approximately 50 seconds the voltage at the gate of T805 exceeds the threshold formed by the Zener diode, current flows in the base of the transistor T806, which now activates the relay. The delay circuit is fed by the regulated 20-V power supply in the set. Adjustment of the delay time is not necessary.

3.1.10 50-to-460-V Stabilizing Circuit

(see circuit diagram 41420-51 S)

The 50-to-460-V stabilizing circuit supplies the klystron with the appropriate reflector voltage and is located on the plug-in circuit board 41420-51. It contains:

- (a) An input control circuit. This consists of the shunt amplifier T902 and the series transistor T901. The reference voltage is generated at the Zener diode G1 906. The following main control section also controls the output voltage of the input control section to some extent via T903.
- (b) The load stage, consisting of the shunt transistor T911. This stage generates a constant load current with widely varying output voltages of the stabilizing circuit. For this purpose the

base is connected to the auxiliary voltage of +35 V, whereby the collector current is controlled in such a way that the voltage drop across the emitter resistor R932 is approx. 35 V.

- (c) The main control section. This contains the differential amplifier T908 and T907, the two shunt amplifiers T906 and T905 and the series transistor T904. The Zener diodes G1 911 and G1 912 generate a reference voltage of 16.8 V. The differential amplifier compares the voltage at the output attenuator R924 to R927 with the reference voltage. The difference is amplified and fed in phase to the series transistor T904, so that all changes in the output power are balanced out.

In order to be able to vary the output voltage of the stabilizing circuit from 50 to 460 V, the stages T909 and T910 are incorporated in the output attenuator.

By varying the automatic reflector tuner (represented in simplified form by R1301 in the circuit diagram 41420-51), the low end of the reference attenuator in the main control section is shifted.

The automatic reflector tuner is supplied with a stable reference voltage of 16.6 V. The emitter terminal of T909 and thus the low end of the reference attenuator is maintained at the voltage set at the wiper of R1301 with respect to the positive output St901.5. Since the attenuation ratio of the reference attenuator (R924 to R927) here remains the same, a change in the automatic reflector tuning will result in a corresponding change in the output voltage.

A high voltage between St901.5 and St901.7 (e.g. 14 V) generates an equally high voltage at the emitter of T909. Since the voltage at the base of T908 is maintained at the level of the reference voltage by means of comparison, only a very small voltage drop is present at the attenuator resistors R924 and R925. The voltage at the other two attenuator resistors is then

also small, corresponding to the attenuation ratio, and the output voltage of the stabilizing circuit becomes a minimum. A given output voltage of the stabilizing circuit at a given position of the automatic reflector tuner can be set with R925.

By driving T903 with a voltage proportional to the output voltage, the input control section can be controlled in accordance with the output voltage setting in order to distribute the voltage uniformly between the series transistors. The output voltage of the input control section is set with R903.

Automatic Reflector Tuner

The reflector voltage appropriate to each oscillator frequency is set by means of a retransmitting potentiometer. The automatic reflector tuner is located on the circuit board 41420-1.75 in the cast housing of the oscillator and is mechanically coupled to the tuning mechanism of the signal generator.

The voltage characteristic of the potentiometer is matched to the tuning characteristic of the klystron by shunt-connected resistors. A cam-wheel controlled switch selects the correct oscillating mode of the oscillator (see 3.1.1 Oscillator).

The reflector voltage is set by means of the following trimmer potentiometers to the following frequencies:

500 MHz	setting	with R1303
approx. 890 MHz just before	switching point	with R1304
approx. 890 MHz just after	switching point	with R1305
approx. 1800 MHz	setting	with R1302

3.1.11 20-V, 23-V, 35-V Stabilizing Circuits

(see circuit diagrams 41422-41 S, 41422-42 S, 41422-44 S)

These stabilizing circuits are of equal design and therefore described together. There are only slight differences in the component parts of the boards.

The stabilizing circuits are located on the plug-in circuit board as follows:

20 V 41422-41

23 V 41422-44

35 V 41422-42

Each consists of a series transistor (T401 or T501 or T701) and its driver transistor (T402 or T502 or T702). The shunt amplifier is a differential amplifier stage, the reference voltage being applied to its first input and the reference attenuator being connected to its second output. The reference voltage is generated either by two Zener diodes or by a compensated reference element.

The output voltage is set by means of the potentiometer R410 or R510 or R710 in the reference attenuator.

3.1.12 Modulation Unit

(see circuit diagram 41422-5 S)

The Modulation Unit BN 414221 is provided for the pulse and frequency modulation of the signal generator. It is included in the generator only when ordered.

The Modulation Unit is suitable for modulating the SMAI and also the signal generators SMBI and SMCI. It can be exchanged.

Fig. 20 shows the block diagram of the Modulation Unit. The relevant circuit diagram is 41422-5 S. The circuit essentially consists of the trigger input amplifiers, the repetition period generator, the delay stage and the pulse width stage. The repetition period of the pulse

is determined by a sawtooth generator, consisting of the transistors T307 and T308 with the RC timing element R324 and C312 to C315. The capacitor may be switched in steps to set the repetition period, the charging resistor R324 can be continuously varied for fine adjustment. The capacitor is charged via the emitter terminal of T308. This Miller integrator delivers a linear sawtooth voltage as the capacitor is charged with a constant current during the entire charging period.

The sawtooth generator is followed by a Schmitt trigger consisting of the transistors T309 and T310. In the rest condition, T309 is conductive and T310 out off. As soon as the voltage at the emitter of T308 exceeds a given value as a result of the charging of the capacitors C312 to C315, the Schmitt trigger is switched over. T309 is now cut off and T310 takes over the whole of the current. This terminates the charging of the capacitor, collector current flows in T307, the capacitor is discharged, the Schmitt trigger falls back into the rest position and charging begins once more. The linear sawtooth voltage at the emitter of T308 is available for frequency modulation of the signal generator at the output BuA2 on the rear panel of the Modulation Unit, after impedance conversion in the buffer stages T306 and T305.

In order to provide external synchronization of the repetition period generator, the Schmitt trigger can be switched by a pulse before the switching threshold is reached. The pulse is delivered by the transformer in the base circuit of T309. This switching pulse is generated in the trigger input amplifiers, consisting of amplifiers T301, T302 or T318, T319 and a subsequent second Schmitt trigger which forms the pulses. The Schmitt trigger permits synchronization via trigger input Bu301 or Bu304 with any desired pulse form. The potentiometers R308 and R312 are provided for setting the switching threshold of the Schmitt trigger.

The switching pulses of the Schmitt trigger are transformed into needle pulses by the trigger amplifier T311, T312. These are used for driving the subsequent stages and are at the same time available at the UNDELAYED TRIGGER OUTPUT for external synchronization. The

diodes connected via the transformers L302 and L303 accept needle pulses only in one direction at a time and the current in the other direction in order to deliver perfect trigger pulses.

The following delay stage is a monostable multivibrator and consists of the transistors T313 and T314. In the rest condition T313 is cut off and collector current flows in T314. A switching pulse applied via L302 applies negative potential to the base of T314 for a short time thus switching the monostable multivibrator into the unstable position. The time after which it resets to the stable position is determined by the charging time constant of resistor R352 and capacitors C327 to C330. In order to vary the delay time, the capacitor which determines the time constant can be switched in steps and the resistor continuously adjusted. This stage is followed by another trigger amplifier which converts the switching pulses of the multivibrator into steep needle pulses and amplifies these. Needle pulses can then be taken off at the DELAYED TRIGGER OUTPUT (Ba303). They are delayed with respect to the trigger pulses at the UNDELAYED TRIGGER OUTPUT by an amount adjustable by varying the time constant in the multivibrator of the delay stage. See pulse diagram Fig. 21. +)

The pulse width stage also consists of a monostable multivibrator which equals in circuit design to that of the delay stage. The switch S304 permits the pulse width stage to be driven either with undelayed or with delayed trigger pulses, depending on whether the inputs 14 and 15 of the multivibrator are connected to L302 or L304.

The pulse width is adjusted, in the same way as in the delay stage, by varying the reset time of the multivibrator. The output pulses are available at BaA1 on the rear of the Modulation Unit for the pulse modulation of the signal generator.

+) For positive pulses the diagram applies accordingly with reversed polarity.

3.2 Repair

If major repair work is to be carried out, the set should always be returned to the factory. The following instructions enable the user to rectify a number of defects, in particular such as caused by normal aging of parts, e.g. the oscillator valve.

Figs. 25, 26 and 27 show the position of individual subassemblies and of the test and adjustment points, so that the test points and adjustment elements can be readily located with the aid of the relevant circuit diagram.

The use of plug-in circuit boards makes it possible to forward the individual subassemblies for repair or to replace them altogether when they are found to be the cause of the breakdown.

3.2.1 Checking the Operating Voltages

In case of a breakdown of the set, first check the different operating voltages. Do not take a measurement until the switch-on delay has responded (READY lamp lights up). The PM modulation switch should be at CW. If the power fuse has blown see 2.2.

All voltages in the set are not taken to chassis, but the majority are at the resonator potential of the klystron (see Fig. 24). Particular care should therefore be taken to ensure that the test equipment and connection leads used withstand not only the voltage being measured but also the voltage to chassis potential. The resonator voltage is 300 V. The highest potential present in the set is about 760 V with respect to chassis. A meter with an input impedance of at least 10 k Ω /V should be used for the voltage measurements.

The resonator voltage, the positive and negative grid voltages and the heater voltage of the valve may be measured at the terminal strip near the klystron socket on the left-hand side of the set (see Fig. 27). The position of the test points and the nominal value

of the voltage being measured are inscribed. The -300 V resonator voltage should be measured to chassis and all other voltages to -300 V. All voltages should be maintained within the permissible tolerance of $\pm 3\%$. The value of the positive grid voltage (+4 to +18 V) varies according to the particular valve used and according to the age of the valve. It should be between +15 and +22 V. A high value of the positive grid voltage indicates an aged valve or a valve with low trans-conductance.

If the resonator voltage of -300 V fails, first check the fuse at the rear of the set (see section 3.1.7).

In order to measure the reflector voltage, the +35-V auxiliary amplifier voltage and the voltage of the automatic reflector tuner, a second terminal strip with test points is provided at the underside of the cast housing on the right-hand side of the set (see Fig. 26). The location of the test points and the nominal values of the voltages are also indicated.

The reflector voltage (-50 to -460 V) should be measured with respect to -300 V and should change in value when the tuning knob of the signal generator is operated. Starting at the lower frequency limit, the voltage should increase up to the switching point at 890 MHz; then fall back and rise again as tuning is continued.

The +35-V auxiliary amplifier voltage should be measured to reflector potential (-50 to -460 V) and be maintained within a tolerance of $\pm 4\%$.

The -20-V auxiliary voltage to chassis is measured at the contact strip (rear side of set) which accepts the plug-in Modulation Unit.

All voltages can be adjusted by means of potentiometers. These are located on the appropriate circuit boards. When adjusting the voltages, note that the centre terminal of the potentiometer may be at high voltage with respect to chassis. Do not use a metal screw-driver in any case.

A test point is provided on the circuit board of the 300-V stabilizing circuit (41420-50) for checking the resonator current. At this point the voltage drop produced by the current across a resistor is measured. The voltage between terminals Bu1001.1 and Bu1001.5 should be 2.15 V (with the PM switch at CW). The voltage can be adjusted with the potentiometer R1019 on the circuit board 41420-50.

3.2.2 Replacing the Klystron

The klystron is guaranteed by the manufacturer for a service life of 500 operating hours or one year from the date of delivery.

For replacement of the oscillator valve, the set should preferably be handed to the local dealer or be forwarded to the manufacturer. Adjustment at the factory gives the best guarantee that all electrical specifications of the set are restored. If this, for some particular reason, is not possible, the following instructions will enable the user to replace the klystron and to make the necessary adjustments; this however, can only be done with suitable test instruments.

The end of the service life of the klystron is recognized by a decrease in output power over the entire frequency range and a drop in the transconductance. The latter then will require a substantially higher grid voltage to reach the nominal value of the resonator current. When therefore the positive grid voltage of +4 to +18 V approaches the upper limit of +22 V, it indicates a valve with too low G_m . (For measuring the positive grid voltage see 3.2.1.)

In order to replace the klystron, unscrew the socket by turning anti-clockwise of the knurled nut (Fig. 27), with which the valve socket, carrying the pulse modulation stage is attached to the resonator. After withdrawal of the socket the valve can be pulled out of the resonator. Care should be taken here that no radial force is applied as this may easily damage the valve inside the resonator.

A replacement valve can be ordered through the local representative or directly from the manufacturer. The valve concerned is the reflex klystron type RK 5837 made by Raytheon. The new valve should be firmly pushed in against the contact springs of the resonator without applying radial force. Insert the heat abduction ring, loosen the lock nut and adjust the aluminium nut in such a way that its front side is flush with the valve base (see Fig. 28). Then retighten the lock nut.

The terminal for g_1 is marked by a dot on the base of the klystron and in addition is recognized by its greater distance from the other pins. When fitting the valve socket, the position of this mark should exactly correspond to the mark on the socket (red dot). The socket can then be screwed down with the coupling ring.

Whenever a valve is replaced, it is necessary to adjust the grid voltage and, in order to restore the frequency accuracy, to correct the tuning curve and the automatic reflector voltage setting.

3.2.3 Adjusting the Grid Voltage

The correct grid voltage for CW operation is adjusted automatically. Manual adjustment is needed only for pulse-modulated operation.

For this purpose the PM switch must be at 1 kHz INT. and a DC voltmeter ($2.5 \text{ V/R}_{in} > 10 \text{ k}\Omega$) be connected between Bu1001.1 and Bu1001.5 (Warning! The meter is at 300 V). The test voltage can be set to 1.4 V by means of potentiometer R605 on the circuit board for the 4 to 18-V stabilizing circuit 41422-43. (Do not use a metal screwdriver for adjustment: high voltage!)

3.2.4 Frequency Adjustment

In order to adjust the frequency, remove the cover of the oscillator housing. This provides access to the tuning drum and the automatic reflector tuner. Slightly loosen the screws on the tuning arm of the tuning drum and also screws No. 1 to 8 and 10 to 18 of the tuning spiral.

Set the PM switch to 1 kHz INT.

Set the FM switch to FM-EXT. and feed a modulation signal of $2 V_{pp}$ and approximately 20 Hz repetition frequency (sinewave or sawtooth) to the PM input. If the signal generator has a built-in Modulation Unit set the FM switch to position INT. The modulation signal can also be used to trigger or deflect an oscilloscope. Connect the DC input of the oscilloscope (50 mV/cm) to the socket MOD.-TEST of the signal generator and set the RANGE selector to MOD.-TEST. The modulation frequency fed in varies the reflector voltage of the klystron by ± 10 V, which results in a corresponding variation of the output frequency. The screen of the oscilloscope now displays a pulse signal proportional to the output power of the signal generator; its amplitude varies with the reflector voltage. The DC reflector voltage adjusted by the automatic reflector tuner is displayed exactly in the centre of the screen (see Fig. 29).

If the reflector voltage differs widely from the rating, other oscillation modes, at which the oscillator delivers other frequencies, are visible besides the required reflector mode.

The oscillator valve is at the same time pulse-modulated in order to avoid pulling effects and hysteresis in the reflector voltage during modulation.

Connect a frequency meter with a frequency accuracy of at least 1×10^{-3} to the output of the signal generator (e.g. Rohde & Schwarz Frequency Meter Type WAL BN 4321/2). The generator frequency may also be determined by comparison with a spectrum which is generated by multiplication of a crystal-controlled reference frequency. If an oscilloscope with twin-channel input is available for the power output indication of the signal generator, the output voltage of the frequency meter or, via a preceding low-pass filter, the difference frequency (produced when mixing with the crystal spectrum) can be shown as a frequency marker via the input of the second channel. Fig. 31 shows the block diagrams of the three test set-ups.

3.2.4.1 Setting the Reflector Voltage

In order to adjust the signal generator, set the reflector voltage in such a way that maximum output power is obtained, i.e., the maximum is shown in the centre of the screen when using an oscilloscope. No range is allowed to occur in which the oscillation is interrupted or the klystron oscillates in other reflector modes (see section 3.1.1). Fig. 29 shows the oscillograms.

The reflector voltage is set with the potentiometers on the circuit board of the automatic reflector tuner, which is located in the cast housing. Be sure to use an insulated screw-driver for the adjustment, since the potentiometers are at high potential. Each potentiometer is used for a particular frequency; see section 3.1.10.

3.2.4.2 Setting the Frequency

Adjust the frequency in such a way that the tuner arm on the piston of the oscillator exactly touches the fixed point of the tuning spiral. This corresponds to point No. 9 on the drum and to a frequency of approx. 1120 MHz.

By turning the adjusting nut on the right-hand side of the tuning drum, set the frequency in such a way that the oscillator actually oscillates at the frequency that has been set on the digital counter. Clockwise rotation of the adjusting nut produces a decrease in frequency, and vice versa.

Make this adjustment for each adjusting point, proceeding from the fixed point No. 9, centrally located on the spiral, first adjusting the points 8 to 1 for the lower frequencies and then the points 10 to 18 for the higher frequencies. The other frequency points are adjusted by shifting the spiral on the drum, i.e. by turning the adjusting screws with a screwdriver inserted through the opening in the right-hand side of the cast housing. Fig. 31 shows the adjusting procedure.

Final Alignment

Repeat the reflector voltage adjustment described in section 3.2.4.1, then adjust the frequency again until the frequency accuracy of $\pm 0.5\%$ is maintained.

Then tighten and glyptal the set screws on the tuner arm of the drum and the attachment screws.

3.2.5 Adjusting the 1-kHz Oscillator

Should the repetition frequency of the 1-kHz pulse have altered by aging or as a result of other causes, or should a very accurate repetition frequency be required for a very narrow-band indication system, or if a value which is somewhat different from 1 kHz is required, the adjustment can be made by re-aligning the 1-kHz oscillator.

The frequency can be changed by turning the tuning slug in the oscillator coil L201. This coil is located on the circuit board of the 1-kHz oscillator 41420-53 on the left in the circuit board cassette. The output frequency is measured with respect to chassis at Bu201.3.

3.2.6 Zeroing and Calibration of the Power Indication

With the PM switch in the position STANDBY, the residual indication can be read on the panel meter. Set the RANGE selector to the -10-dBm position. The residual indication should remain less than 2 mm on the scale. If it has increased due to aging of the chopper transistors, readjustment is necessary. This can be carried out with the potentiometers R102 and R103 on circuit board 41420-52. They should be adjusted in turn, as they exert an effect on each other. If the adjustment cannot be improved, the chopper transistors T101 and T102 should be interchanged with one another or with other transistors on the circuit board which have the same type.

If the rectifier diode in the indication directional coupler is replaced, or if the accuracy of the indication has deteriorated, which may be determined by checking the output power against a power meter, the ranges should be readjusted. A separate potentiometer is provided for each range.

Range:	-10 dBm set with R126
	0 dBm set with R117
	+10 dBm set with R32
	+20 dBm set with R37

R126 and R117 are located on the circuit board of the chopper amplifier I, R32 and R37 on the circuit board mounted against the range selector switch (in 41420 S Bl. 1).

3.2.7 Setting the Schmitt Trigger

When transistors are replaced in the Schmitt trigger 41420-1.90.20 or changes occur in the unit after long operating hours, the Schmitt trigger may not exactly switch in the rhythm of the modulation signal or may not completely block the klystron in the position STANDBY. In this case R112 on the circuit board 41420-1.90.20 on the klystron socket should be reset.

For this adjustment connect an oscilloscope via a capacitor of $0.1 \mu\text{F}/350 \text{ V}$ to point 3 of the circuit board and feed a 2-V_{pp} sine-wave of 1 MHz to the input EXT.-MOD.PM. Now adjust with R112 in such a way that at point 3 symmetrical pulses (pulse width $\approx \frac{1}{2} \times$ period) with the repetition frequency of the driving pulse are measured. Even when a lower frequency is used for driving ($\sim 500 \text{ Hz}$) the symmetry of the pulses should be approximately maintained.

With the PM switch in the position STANDBY a voltage of -14 to -18.5 V with respect to -300 V, should result at point 3 (measured with meter at point 3 and -300 V at terminal strip).

3.2.8 Replacing the Indicator Lamps

In the case of failure of the lamps 11 or 15 they may be replaced from the front panel. The lens fitted to the holder can be withdrawn by means of a small screwdriver. The lamps are miniature plug-in telephone lamps with T5.5 base.

They can be withdrawn with a lamp puller or with a pair of tweezers. Note that the AC supply voltage indicator lamp 11 is a commercially available miniature telephone lamp (filament lamp) 24 V/20 mA (R&S Stock-No. RLT 22401), whereas the READY-indicator 15 is a glow lamp for 220 V AC. (This lamp can be obtained from Rohde & Schwarz under No. RLG 12100.)

After replacing the lamp, the lens should be pushed on with firm pressure, the clear lens being used with the READY lamp and the green lens with the power indicator.

Translations for Figs. 1 to 31

Bild 1

Meßanordnung zum Messen der
Grenzempfindlichkeit von
Empfängern

Ext. Puls-Synchronisierung

Ext. Triggerung

Leistungsmesser NRD

Meßobjekt, Empfänger

Oszillograf

pulsmoduliert

Video Ausgang

ZF-Ausgang

Fig. 1

Test set-up for measuring the
noise figure of receivers

Ext. pulse synchronization

Ext. triggering

Power Meter Type NRD

Test item, receiver

Oscilloscope

Pulse-modulated

Video output

IF output

Bild 2

Empfängerrauschzahl F_E in
Abhängigkeit von der
Meßsender-Ausgangsleistung
 P_a für ein Verhältnis
(Signal- + Rauschschlag)/
Empfängerrauschschlag =
 $\alpha_2 / \alpha_1 = 2$.

Parameter: Effektive
Rauschbandbreite B_e

Fig. 2

Receiver noise figure F_E as a
function of the generator
output power P_a for a ratio
(signal + noise indication)
receiver noise indication =
 $\alpha_2 / \alpha_1 = 2$.

Parameter: effective
noise bandwidth B_e

Bild 3

Anordnung zur
Frequenz-Synchronisation

für ...

HF-Ausgang

Mischkopf

Fig. 3

Set-up for
frequency synchronization

For ...

RF output

Mixer

Quarznormal

Sender

SYNCHR.-EINGANG

Synchronisiergerät

...

Crystal standard

Signal generator

SYNCHR. INPUT

Synchronizer

To

Bild 4

Anordnung zur linearen
Frequenzmodulation

HF-Ausgang

Modulationsfrequenz

Fig. 4

Test set-up for linear
frequency modulation

RF output

Modulation frequency

Bild 5

Meßanordnung zur
Dämpfungsmessung mit Empfänger

Dämpfungsglied

Meßempfänger

Meßobjekt

unmoduliert

Fig. 5

Test set-up for attenuation
measurements with a receiver

Attenuator

Test receiver

Test item

CW

Bild 6

Meßanordnung zur Dämpfungs-
messung mit 1-kHz-Anzeige-
verstärker

Dämpfungsglied

Diodenkopf

1 kHz-Anzeige-Verstärker

Meßobjekt

Fig. 6

Test set-up for attenuation
measurements with a 1-kHz
indicator/amplifier

Attenuator

Diode probe

1-kHz indicator/amplifier

Test item

Bild 7

Meßanordnung zur automatischen
Dämpfungsmessung mit manuellem
Antrieb

Diodenkopf

Gleichspannungsverstärker

mechan. Kupplung

Meßobjekt

Millivoltmeter UVG

Schreiber ZSG

unmoduliert

Fig. 7

Test set-up for automatic
attenuation measurements with
manual drive

Diode probe

DC amplifier

Mechanical coupling

Test item

DC Millivoltmeter Type UVG

Recorder Type ZSG

CW

Bild 8

Meßanordnung zur automatischen
Dämpfungsmessung mit Motorantrieb

Gleichspannungsausgang

Gleichspannungsverstärker

Leistungsmesser

Meßkopf

Meßobjekt

Millivoltmeter UVG

Motorantrieb mechan. gekuppelt

Schreiber

unmoduliert

Fig. 8

Test set-up for automatic
attenuation measurements with
motor drive

DC output

DC amplifier

Power meter

Probe

Test item

DC Millivoltmeter Type UVG

Motor drive mech. coupled

Recorder

CW

Bild 9

Meßaufbau zur automatischen
Reflexionsmessung

Fig. 9

Test set-up for automatic
reflection measurements

Empfänger

Receiver

Meßobjekt bzw. Kurzschluß

Test item or short-circuit

Motorantrieb mechan. gekuppelt

Motor drive mech. coupled

Reflektometer

Reflectometer

Schreiber

Recorder

Bild 10

Fig. 10

Anordnung zur Fernsteuerung
der Frequenzabstimmung

Set-up for remote control
of tuning

Bild 11

Fig. 11

Blockschaltbild zur Messung des
Richtdiagrammes von Antennen

Block diagram for measuring the
directional pattern of antennas

Fernsteuergeber

Remote control transmitter

Fernsteuerung

Remote control

Meßempfänger

Test receiver

Meßturm

Test tower

Meßturm mit Drehstand

Test tower with rotating head

Schreiber

Recorder

Bild 12

Fig. 12

Abmessungen der
frequenzlinearen Welle

Dimensions of the
frequency-linear shaft

Griffwanne

Bracket

maximaler Durchmesser der
Kupplung in der Bohrung 12 mm

Maximum diameter of the coupling
in the hole 12 mm

rechte Seitenaußenwand
des Gerätekastens

Right-hand external wall
of cabinet

Wellenstumpf

Shaft end

Bild 13

Typischer Verlauf des
maximalen Frequenzhubes

Hub

Fig. 13

Typical curve of the
max. frequency deviation

Frequency deviation

Bild 14

Bedienungsbild, Frontplatte

Fig. 14

Front panel controls

Bild 15

Bedienungsbild, Rückseite

Fig. 15

Rear panel controls

Bild 16

Reflexionsdämpfung in
Abhängigkeit vom Stehwellen-
verhältnis s

Fig. 16

Reflection loss as a function
of the SWR

Reflexionsdämpfung

Reflection loss

Stehwellenverhältnis (s)

Standing-wave ratio

Bild 17

Reflexionsdämpfung in
Abhängigkeit vom
Reflexionsfaktor r

Fig. 17

Reflection loss as a function
of the reflection coefficient r

Reflexionsdämpfung

Reflection loss

Reflexionsfaktor (r)

Reflection coefficient

Bild 18

Senderausgangsleistung $[\bar{W}]$ in
Abhängigkeit der Leistung $[\bar{dBm}]$

Fig. 18

Generator output power in W as a
function of power in dBm

Leistung

Power

Bild 19

Ausgangsspannung an $50\ \Omega$ in
Abhängigkeit von der
Ausgangsleistung in dBm

U

Fig. 19

Output voltage into $50\ \Omega$ as a
function of the output power
in dBm

E

Bild 20

Blockschaltbild des
Modulationseinschubes

FM Sägezahnspeg.

Folgezeitgenerator

PM Impulse

Pulsbreitenstufe

Trigger-Ausgang unverzögert

Trigger-Ausgang verzögert

Triggereingang

Triggerverstärker

Verzögerungsstufe

Fig. 20

Block diagram of the
Modulation Unit

FM sawtooth voltage

Repetition time generator

PM pulses

Pulse width stage

Trigger output undelayed

Trigger output delayed

Trigger input

Trigger amplifier

Delay stage

Bild 21

Impulsdigramm des
Modulationseinschubes

Ausgangsimpulse unverzögert

Ausgangsimpulse verzögert

Folgezeit

Impulsbreite

Sägezahn Ausgang

Triggerausgangsimpulse
unverzögert

Fig. 21

Pulse diagram of the
Modulation Unit

Undelayed output pulses

Delayed output pulses

Repetition time

Pulse width

Sawtooth output

Undelayed trigger output
pulses

Triggerausgangsimpulse verzögert

Delayed trigger output pulses

Triggereingang

Trigger input

Verzögerungszeit

Delay time

Bild 22

Blockschaltbild der
Ausgangsleistungsregelung

Fig. 22

Block diagram of the ALC

Abschlußwiderstand

Termination

ext. AM-Eingang

Ext. AM input

Anzeigerichtkoppler

Indication directional coupler

Ausgang

Output

Ausgangs-Anzeige

Output indication

Chopperverstärker

Chopper amplifier

Pegel

Level

Regelverstärker

ALC amplifier

Stellglied

Control element

Bild 23

Blockschaltbild des UHF-
Empfänger-Meßsenders SMAI

Fig. 23

Block diagram of the UHF
Signal Generator Type SMAI

Anzeige-Koppler

Indication coupler

AUSGANG

OUTPUT

AUSGANGSLEISTUNG

OUTPUT POWER

Chopper-Verstärker

Chopper amplifier

EINGANG

INPUT

FM-Verstärker

FM amplifier

Frequenz

Frequency

HF-Ausgang

RF OUTPUT

Modulationsteil

PIN-Regler

Reflektorautomatik

Regelverstärker

Modulation Unit

PIN control stage

Automatic reflector tuner

ALC amplifier

Bild 24

Blockschaltbild der
Spannungsversorgung

Fig. 24

Block diagram of power supply

FM-Eing.

FM-Verstärker

PM-Eing.

FM input

FM amplifier

PM input

Bild 25

Lage der Baugruppen, Meß- und
Abgleichpunkte (Oberseite)

Fig. 25

Location of subassemblies, test
and adjusting points (top side)

Chopper-Verstärker

FM-Verstärker

1-kHz-Generator

nur bei ...

Reflektorspannungseinstellung

Regelteil

Regelverstärker

Chopper amplifier

FM amplifier

1-kHz oscillator

Only with ...

Reflector voltage adjustment

Stabilizing circuit

ALC amplifier

Bild 26

Lage der Baugruppen, Meß- und
Abgleichpunkte (Unterseite)

Fig. 26

Location of subassemblies, test
and adjusting points (bottom side)

Anzeigerichtkoppler

bis

Indication directional coupler

To

Gitterspg.

Grid voltage

Heizspg.

Heater voltage

Meßpunkt für Hilfsspannung -20 V

Test point for -20-V auxiliary voltage

Meßpunkte für Reflektorspg.

Test points for reflector voltage

Meßpunkte für Resonatorspg.

Test points for resonator voltage

Modulationseinschub

Modulation Unit

Verstärkerhilfsspannung

Auxiliary amplifier voltage

Bild 27

Fig. 27

Klystron

Klystron

Mändelmutter zum Öffnen
nach links drehen

To open - turn knurled ring
anti-clockwise

Bild 28

Fig. 28

Einstellen des Gewinderinges
an der Klystronfassung

Adjusting the threaded ring
on the klystron socket

Bild 29

Fig. 29

Oszillogramme zum Einstellen
der Reflektorspannung

Oscillograms for adjusting
the reflector voltage

- a) richtige Einstellung der Reflektorspannung
- b) falscher Schwingmodus im Bereich durch falsche Einstellung der Reflektorspannung
- c) Abreißen der Schwingung durch falsche Einstellung der Reflektorspannung

- a) Correct adjustment of the reflector voltage
- b) Incorrect oscillation mode in the range due to incorrect adjustment of the reflector voltage
- c) Loss of oscillation due to incorrect adjustment of the reflector voltage

U_R

E_r

Bild 30

Blockschaltbilder zur
Frequenzeinstellung

Ext. Abl.

Frequenzmesser

HF-Ausgang

Kanal

Misch.- u. Verzerrerkopf

Quarznormal

Sinusgen.

Tiefpaß

Trigger-Ausgang

Trigger-Eing.

Fig. 30

Block diagrams for
frequency setting

Ext. deflection

Frequency meter

RF output

Channel

Mixer and harmonic generator

Crystal standard

Sinewave generator

Low-pass filter

Trigger output

Trigger input

Bild 31

Einstellen der Frequenzabstimmung

Befestigungsschrauben

Einstellmutter

Einstellschrauben

Einstellen der Reflektorspannung

Mitnehmerarm

Fig. 31

Frequency tuning

Screws

Adjusting nut

Adjusting screws

Setting the reflector voltage

Tuner arm

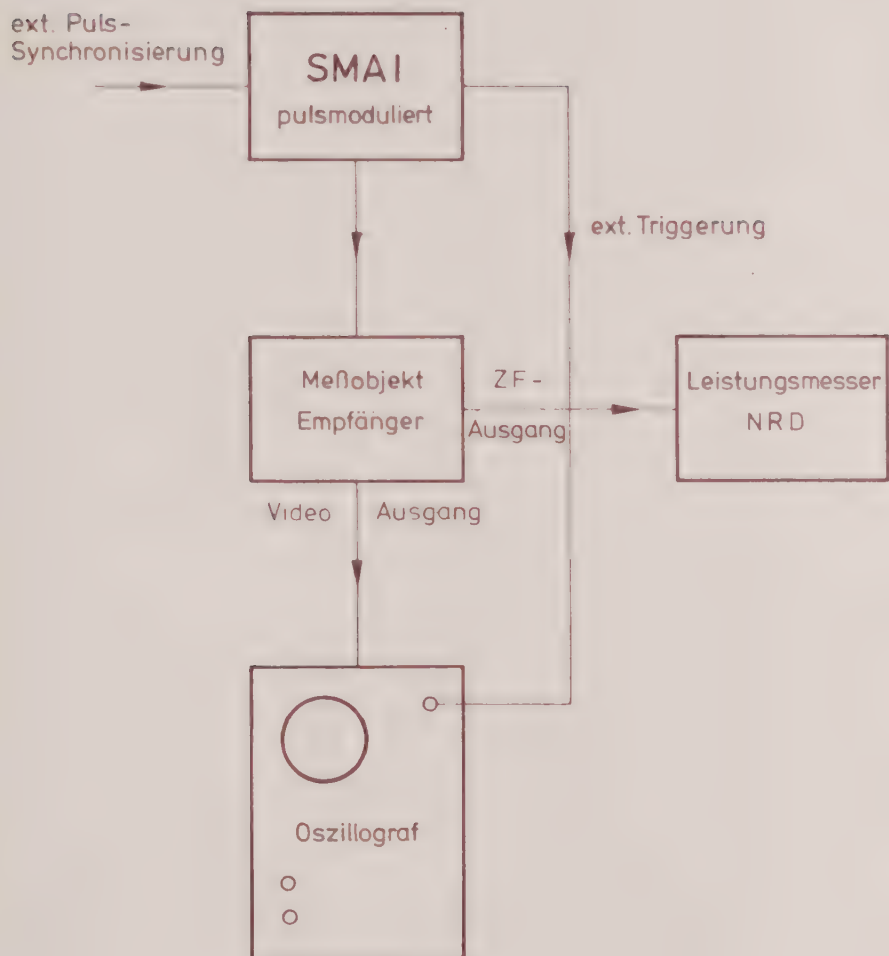


Bild 1 Meßanordnung zum Messen der Grenzeempfindlichkeit von Empfängern

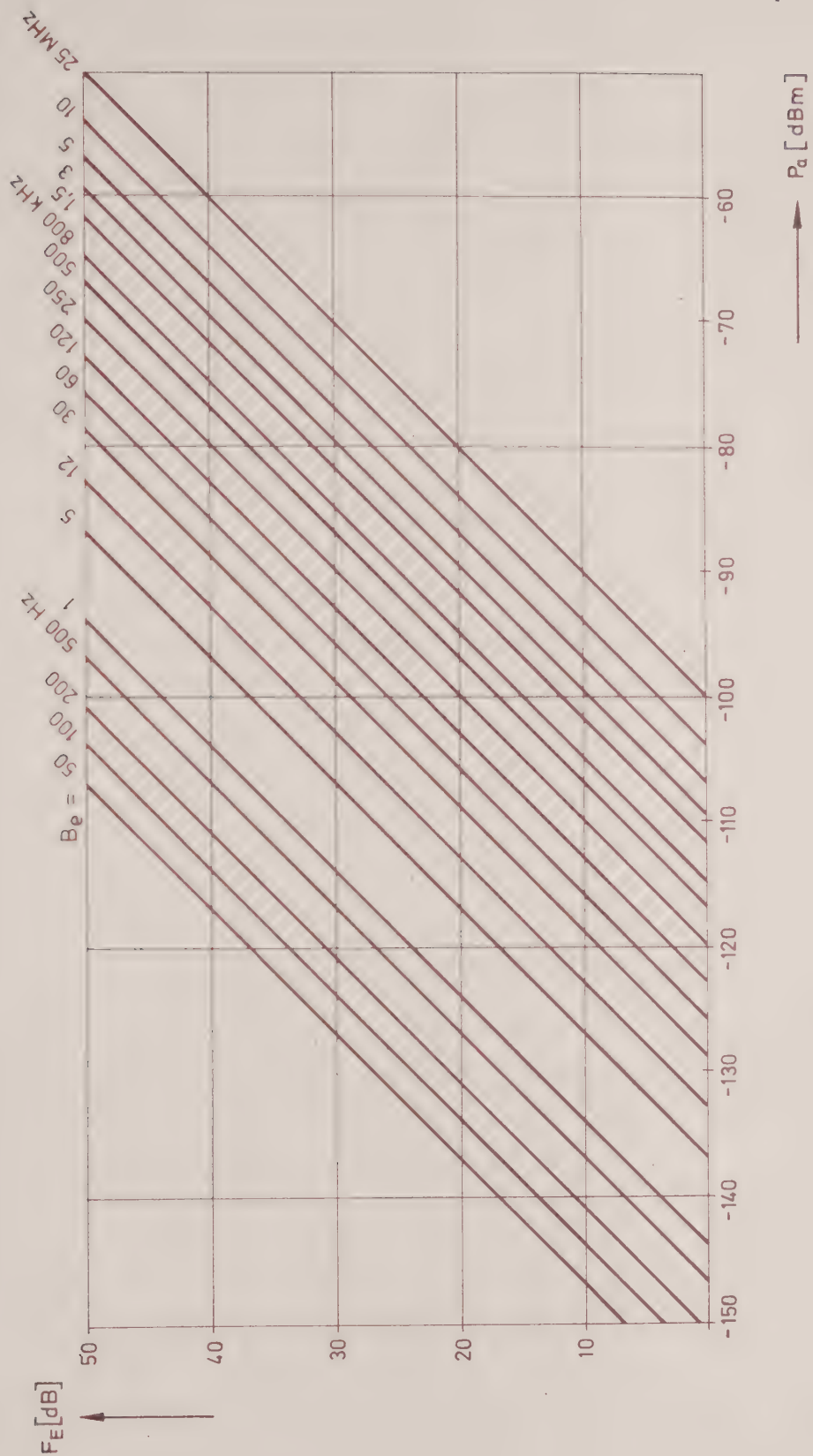


Bild 2 Empfängerrauschzahl F_E in Abhängigkeit von der Meßsender-Ausgangsleistung P_a für ein Verhältnis (Signal- + Rauschschlag) / Empfängerrauschschlag $= \alpha_2 / \alpha_1 = 2$.
Parameter: Effektive Rauschbandbreite B_e

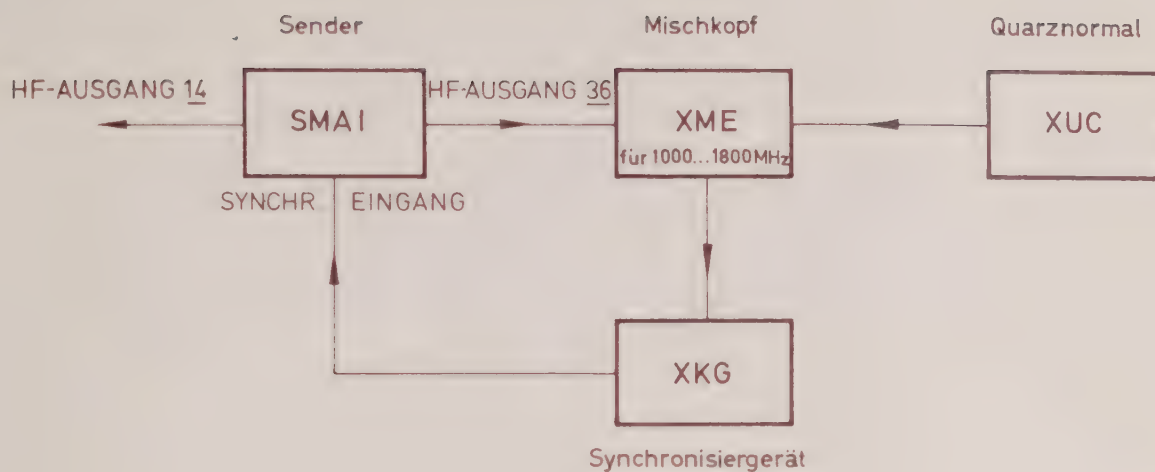


Bild 3 Anordnung zur Frequenz-Synchronisation

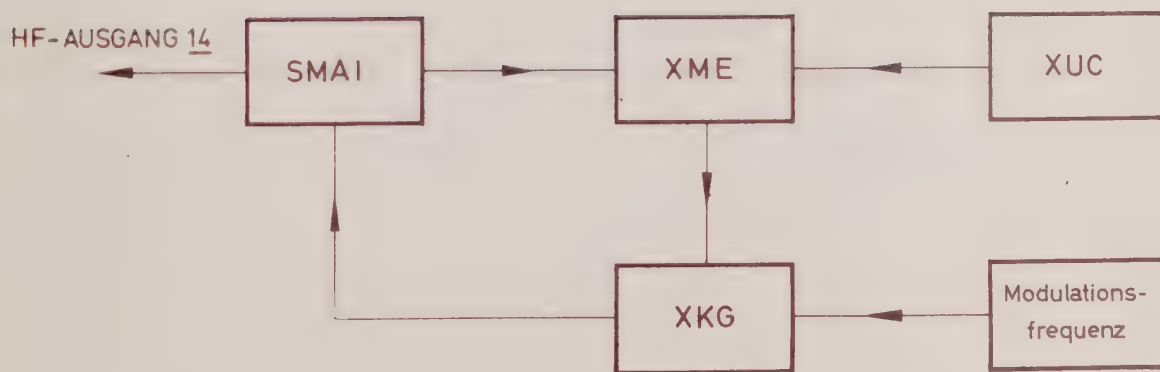


Bild 4 Anordnung zur linearen Frequenzmodulation



Bild 5 Meßanordnung zur Dämpfungsmessung mit Empfänger

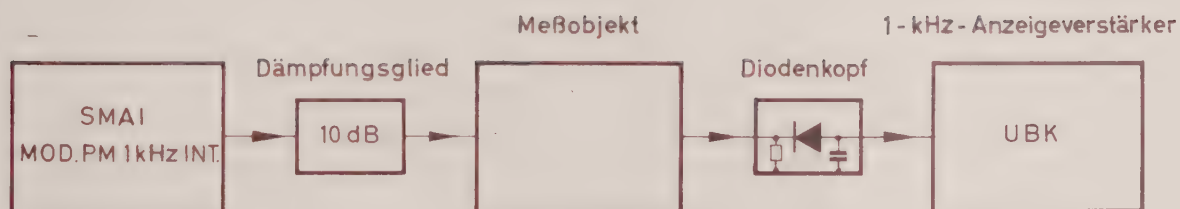


Bild 6 Meßanordnung zur Dämpfungsmessung mit 1-kHz-Anzeigeverstärker

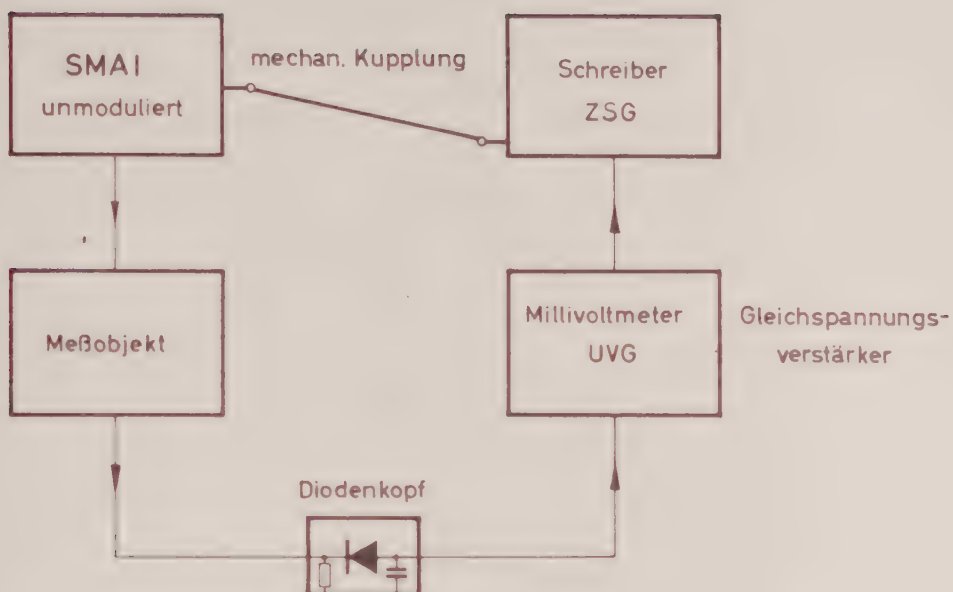


Bild 7 Meßanordnung zur automatischen Dämpfungsmessung mit manuellem Antrieb

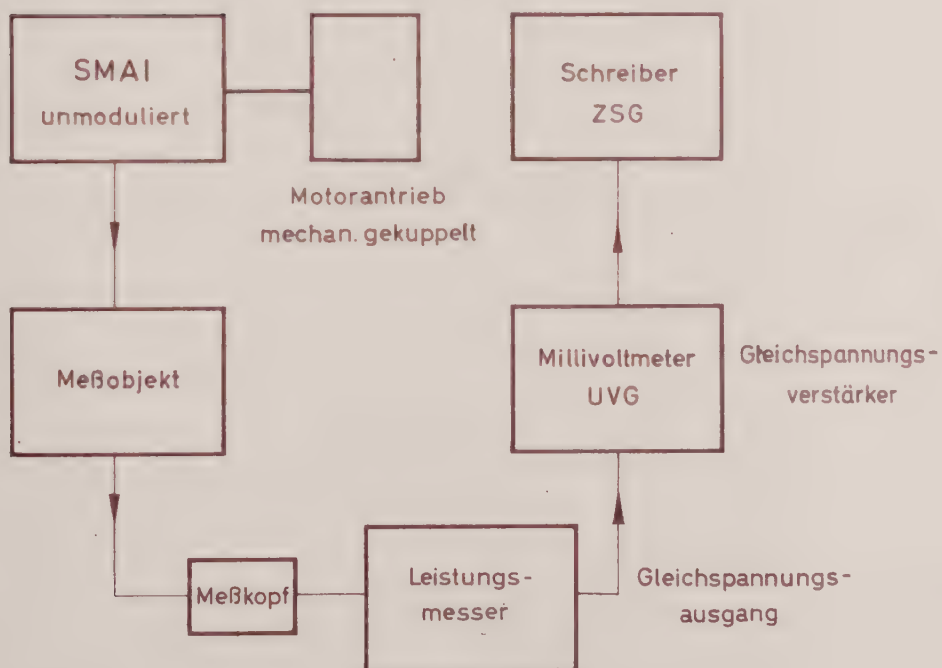


Bild 8 Meßanordnung zur automatischen Dämpfungsmessung mit Motorantrieb

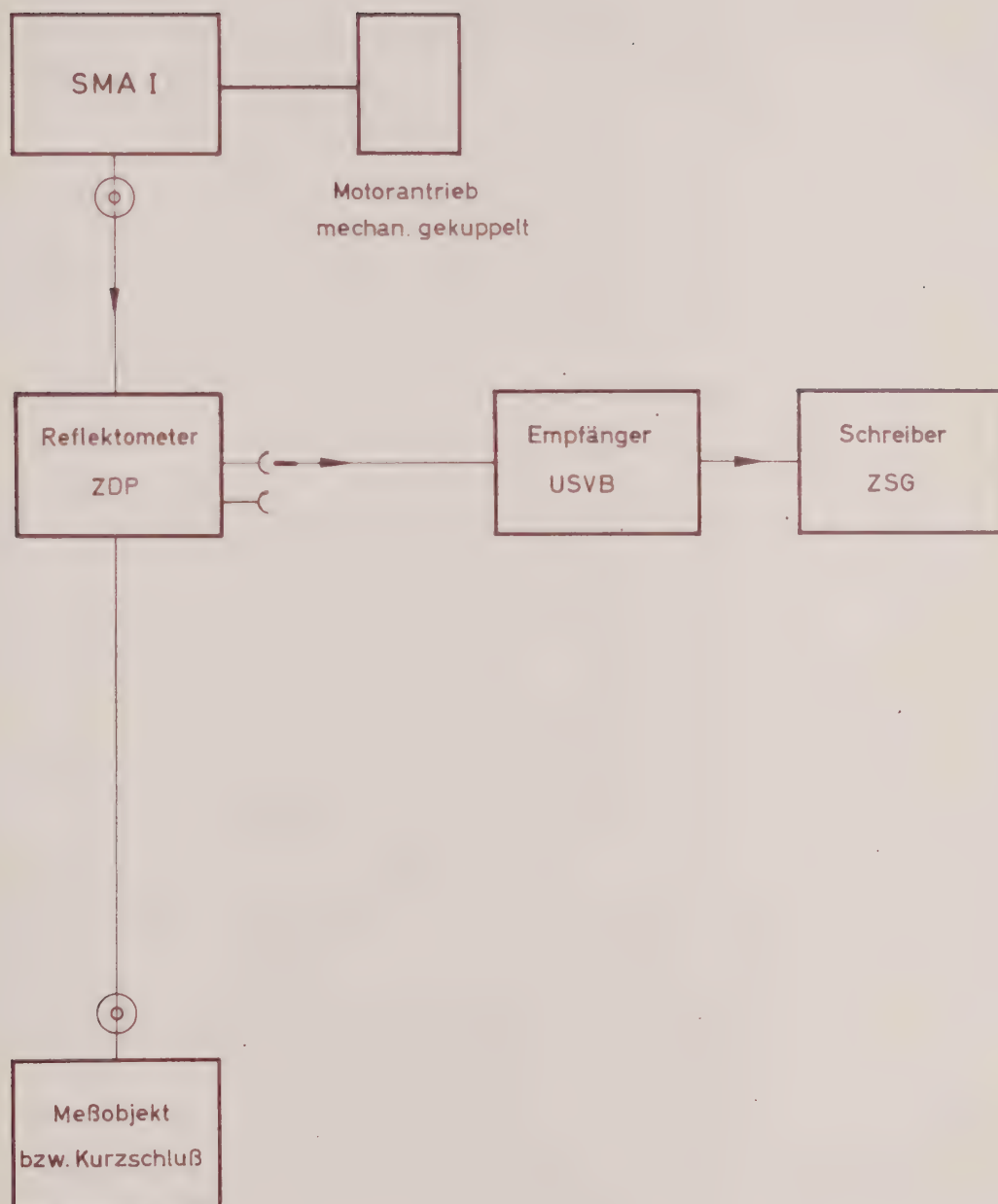


Bild 9 Meßaufbau zur automatischen Reflexionsmessung

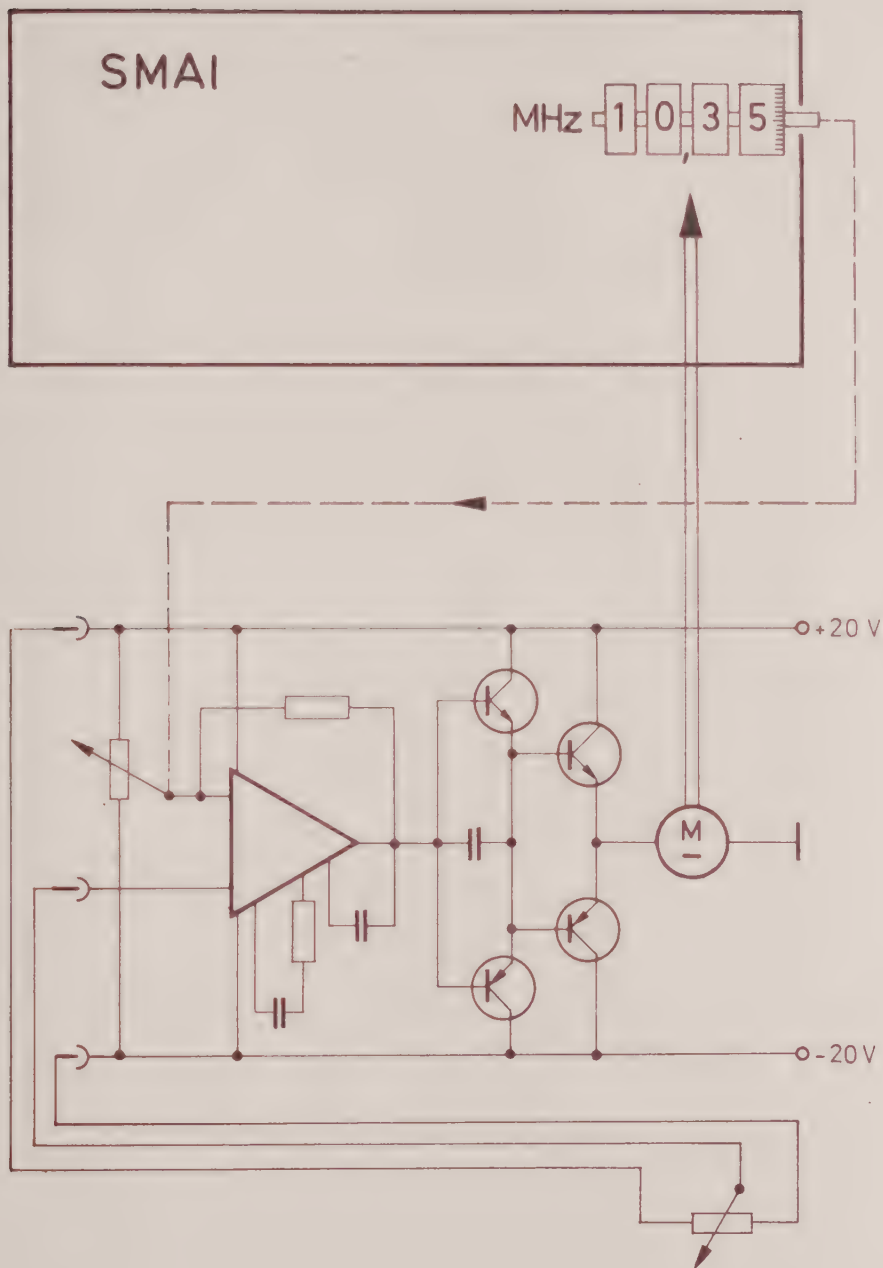


Bild 10 Anordnung zur Fernsteuerung der Frequenzabstimmung

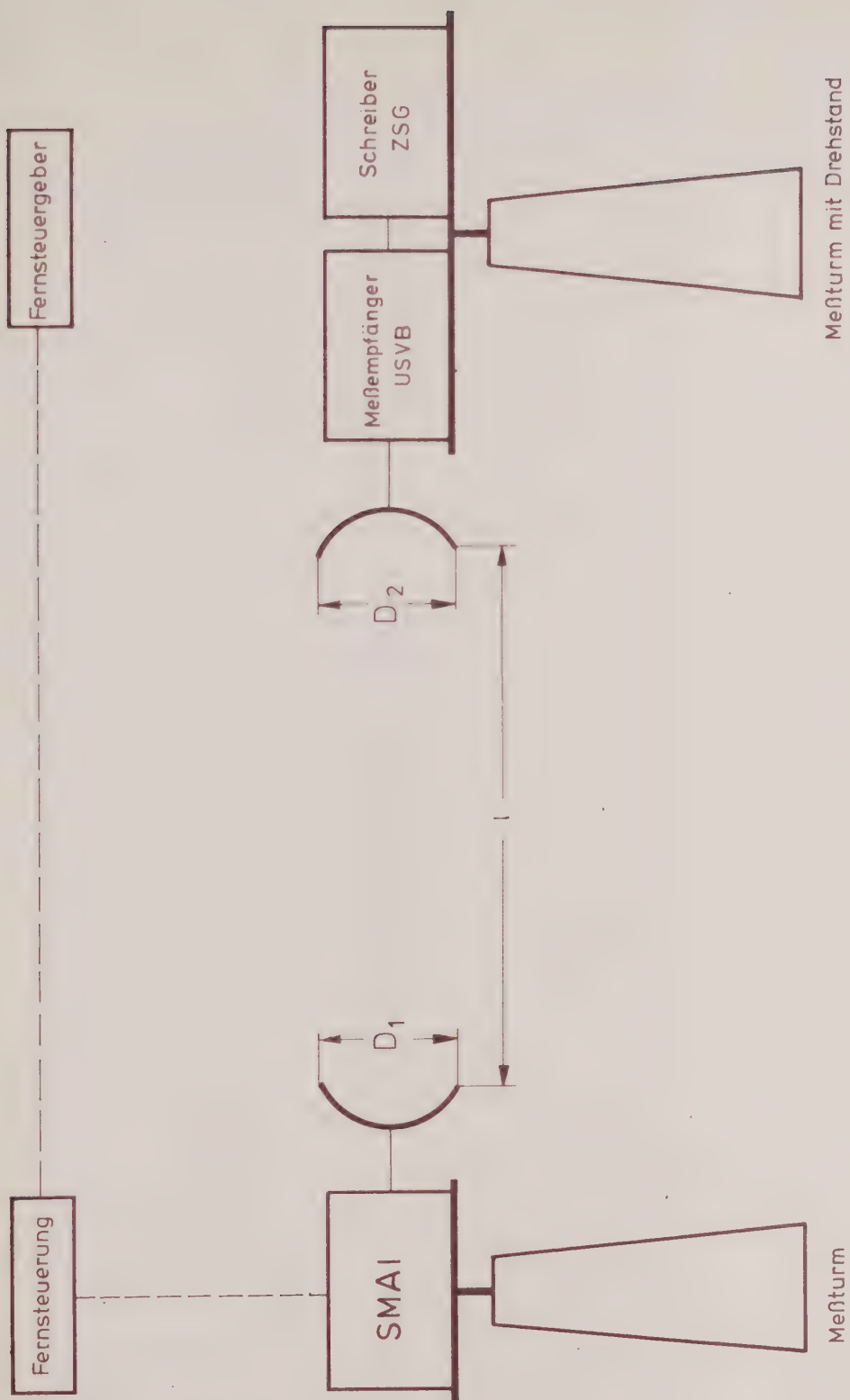


Bild 11 Blocksaltbild zur Messung des Richtdiagrammes von Antennen

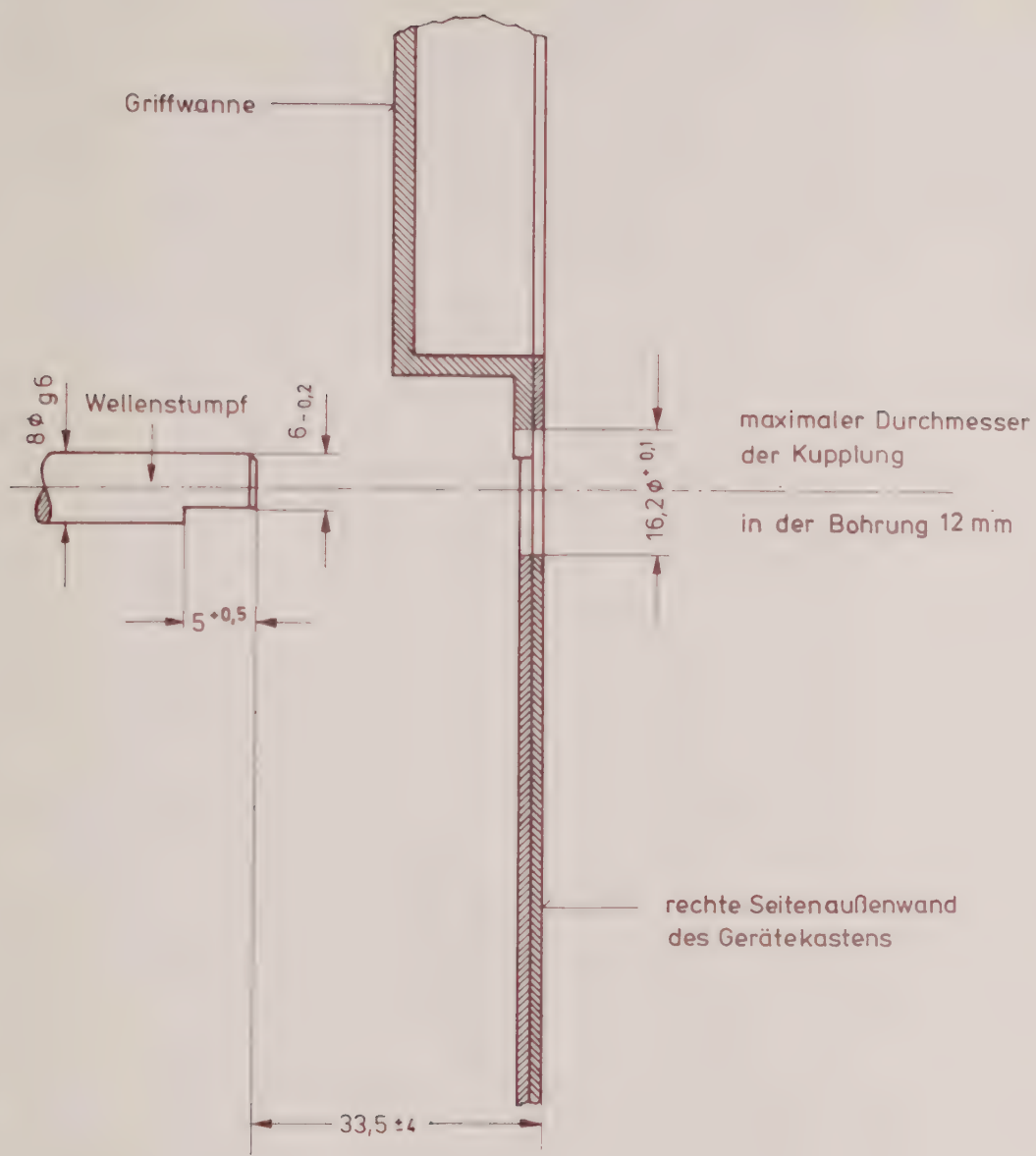


Bild 12 Abmessungen der frequenzlinearen Welle

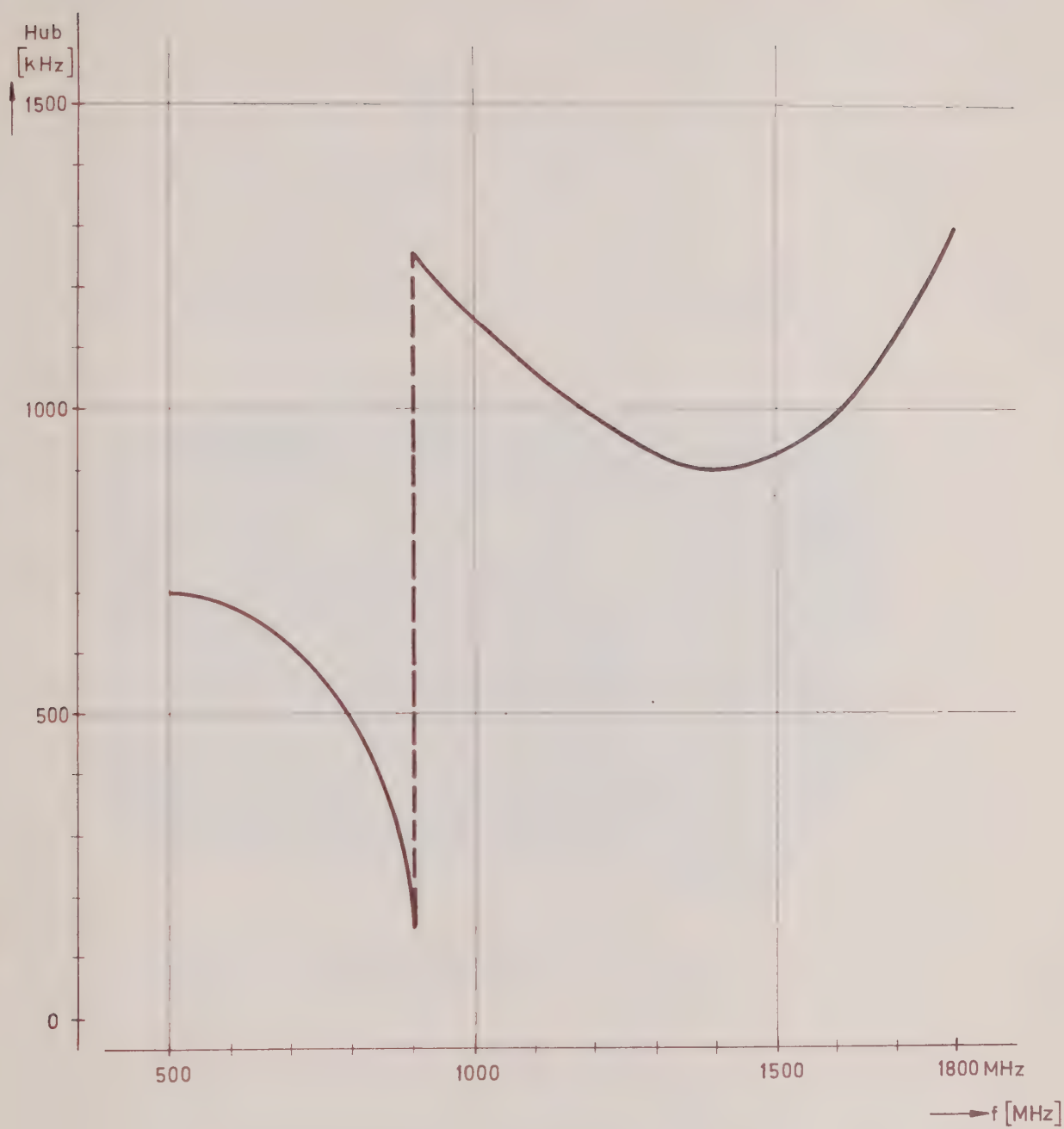


Bild 13 Typischer Verlauf des maximalen Frequenzhubes

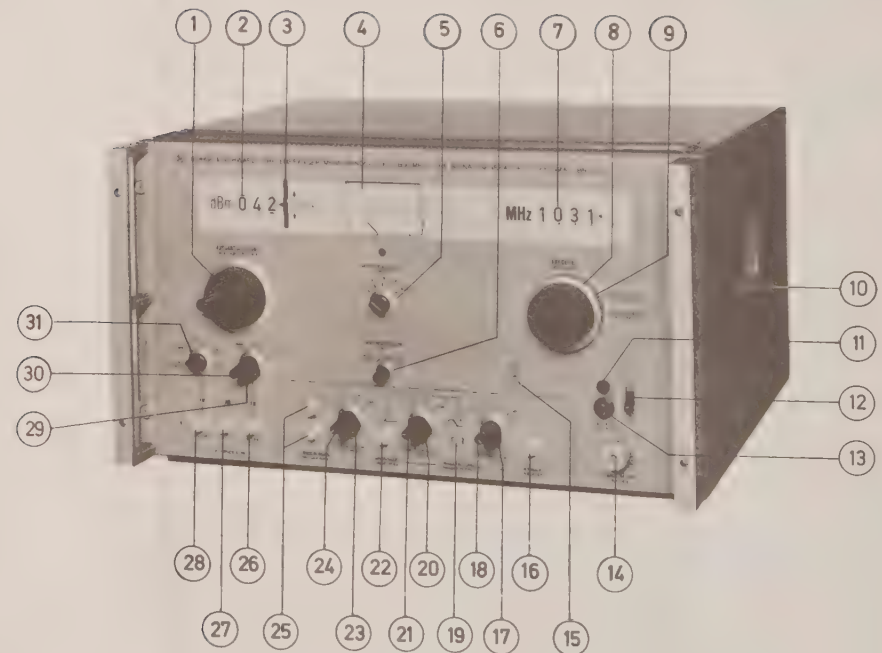


Bild 14 Bedienungsbild, Frontplatte

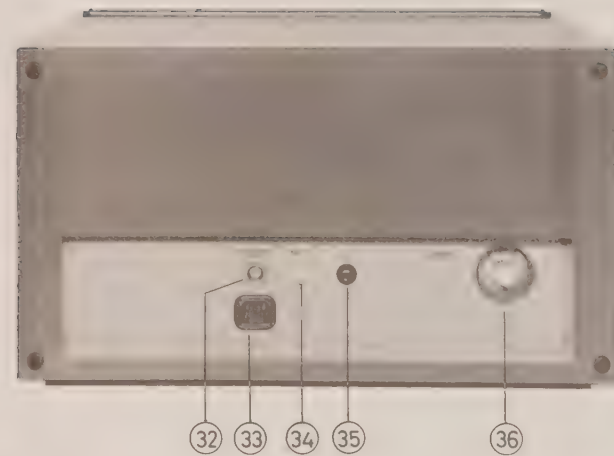


Bild 15 Bedienungsbild, Rückseite

Reflexionsdämpfung [dB]

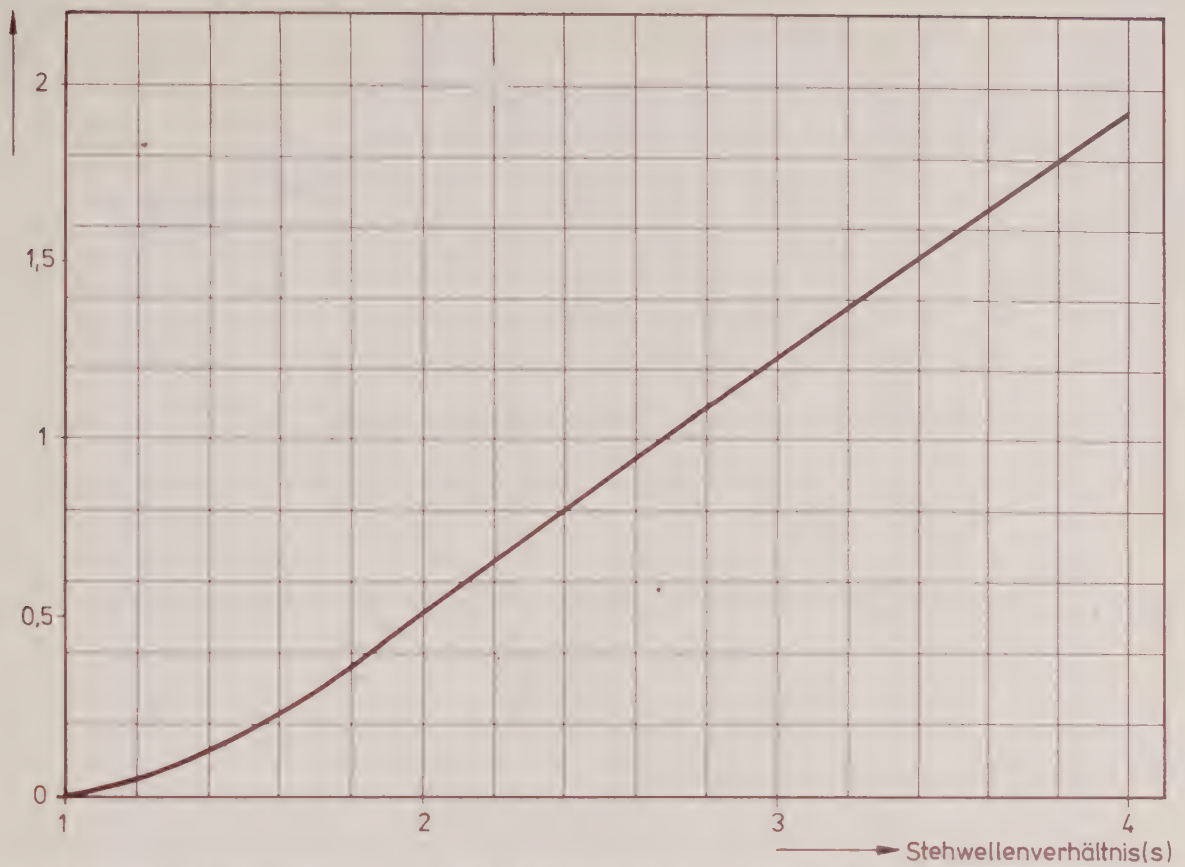


Bild 16 Reflexionsdämpfung in Abhängigkeit vom Stehwellenverhältnis s

Reflexionsdämpfung

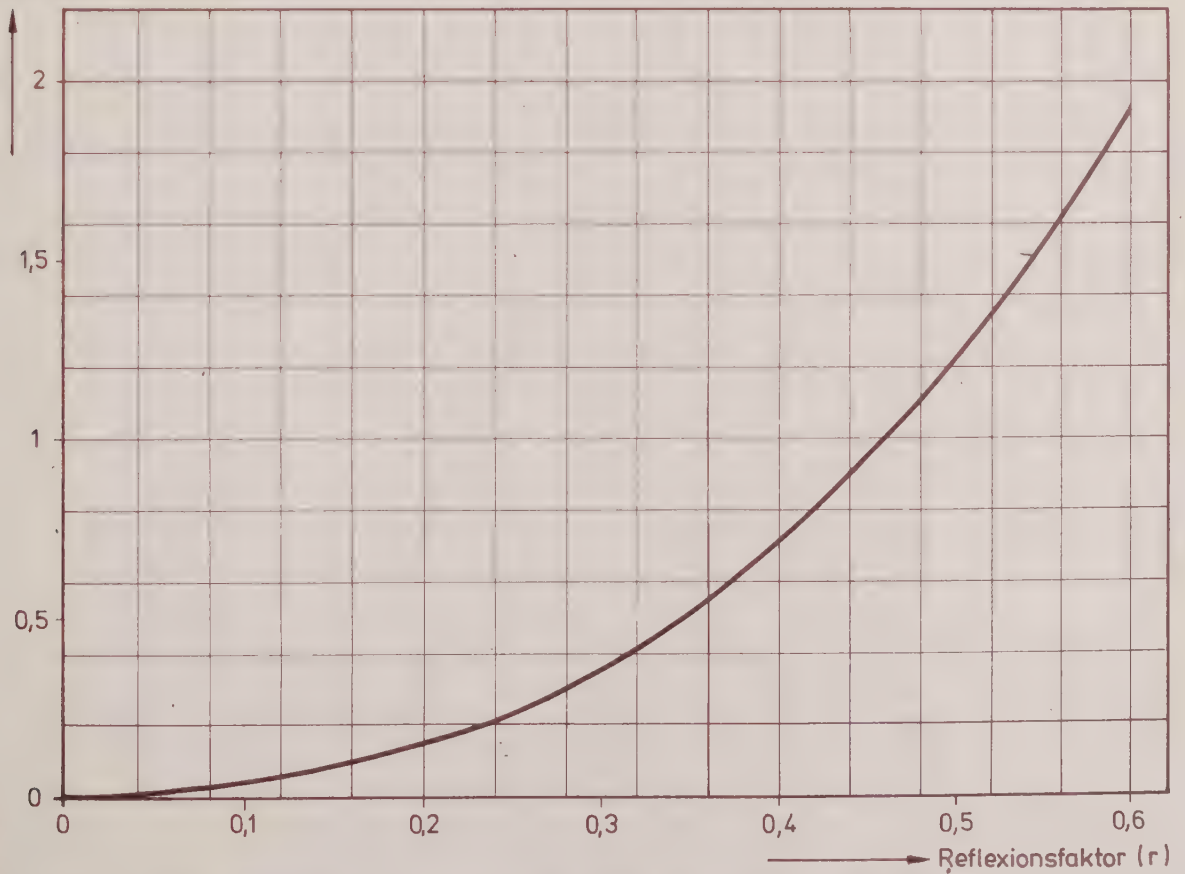


Bild 17 Reflexionsdämpfung in Abhängigkeit vom Reflexionsfaktor r

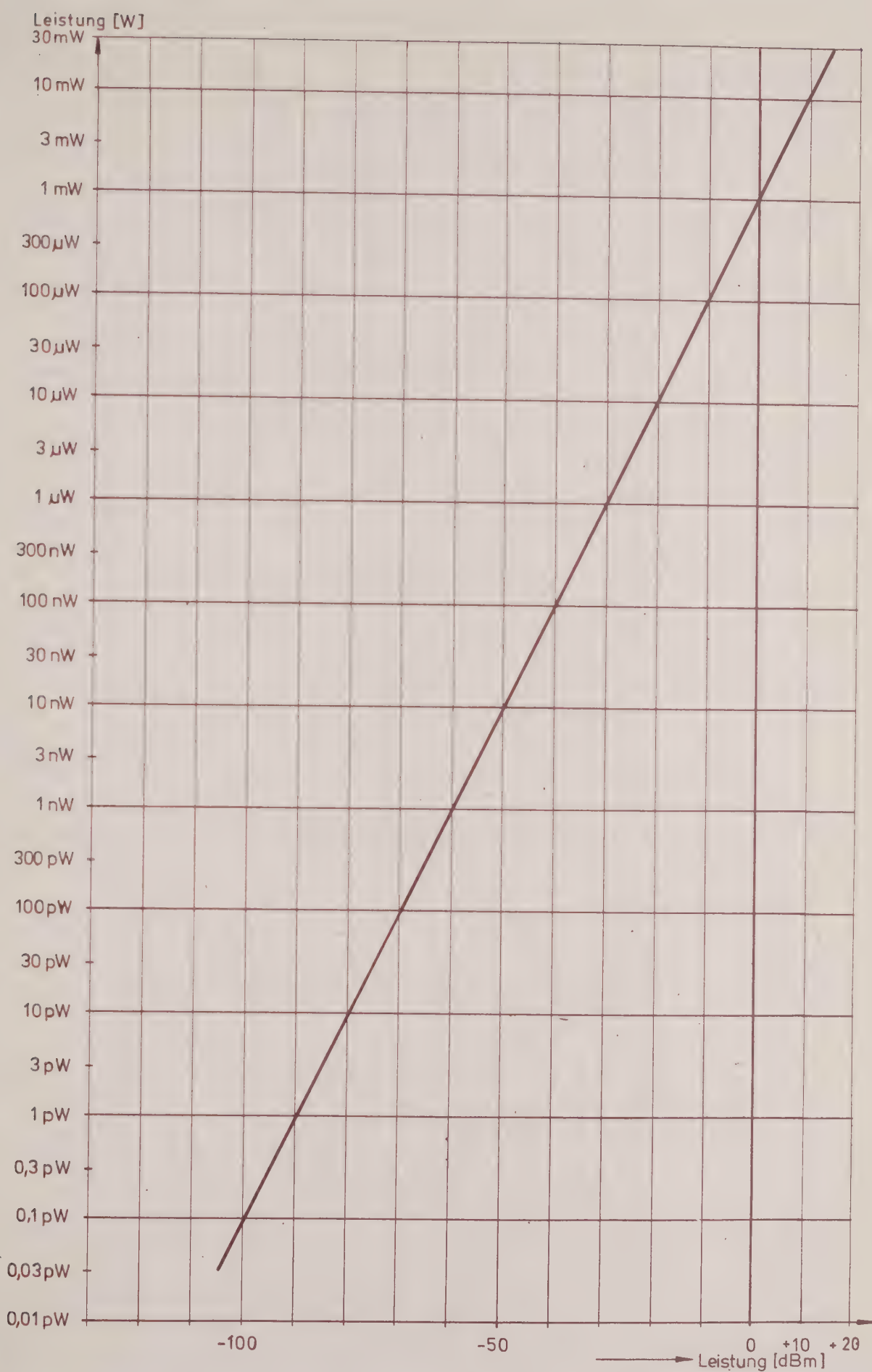


Bild 18 Senderausgangsleistung [W] in Abhängigkeit der Leistung [dBm]

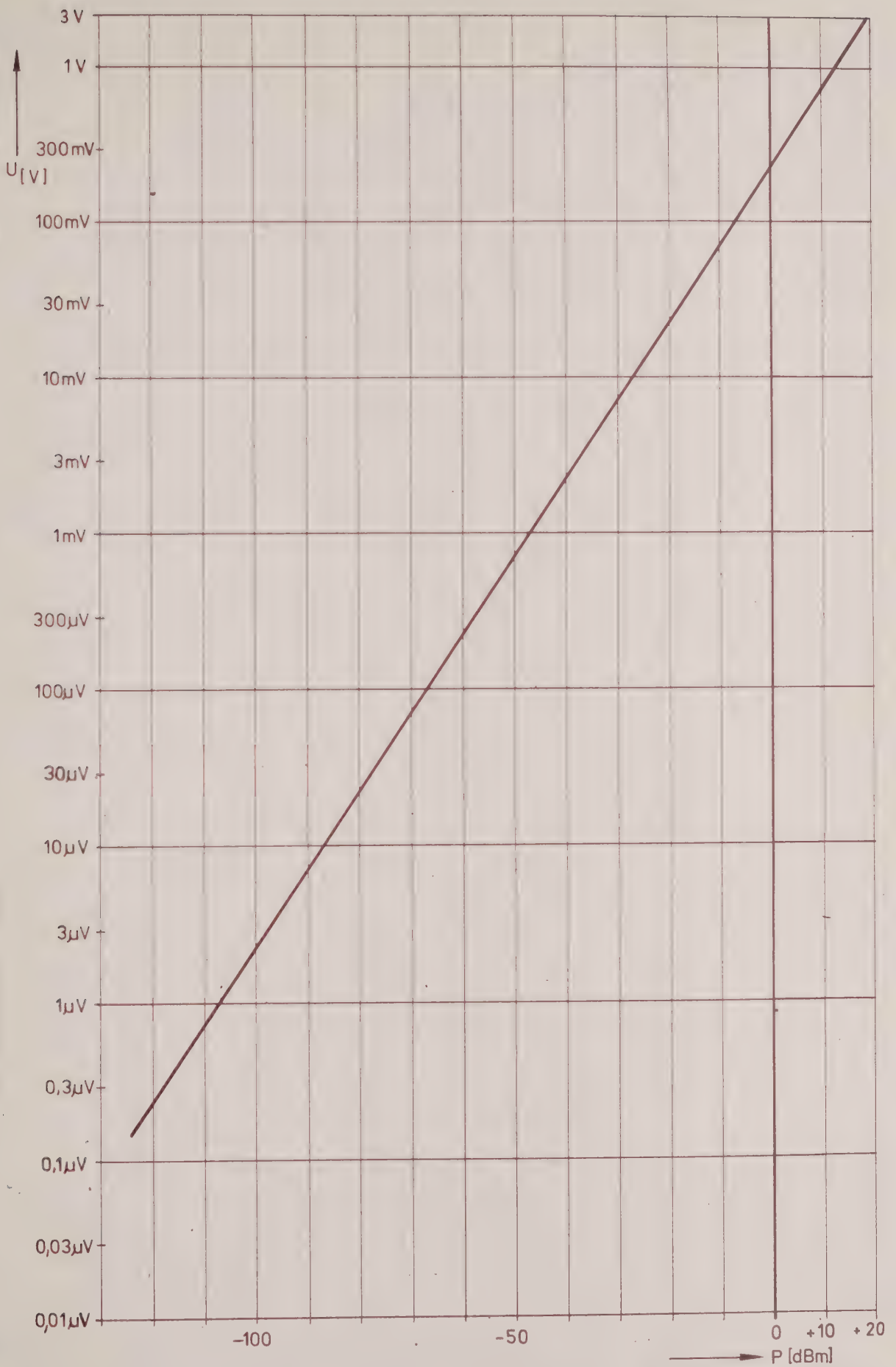


Bild 19 Ausgangsspannung an 50 Ω in Abhängigkeit von der Ausgangsleistung in dBm

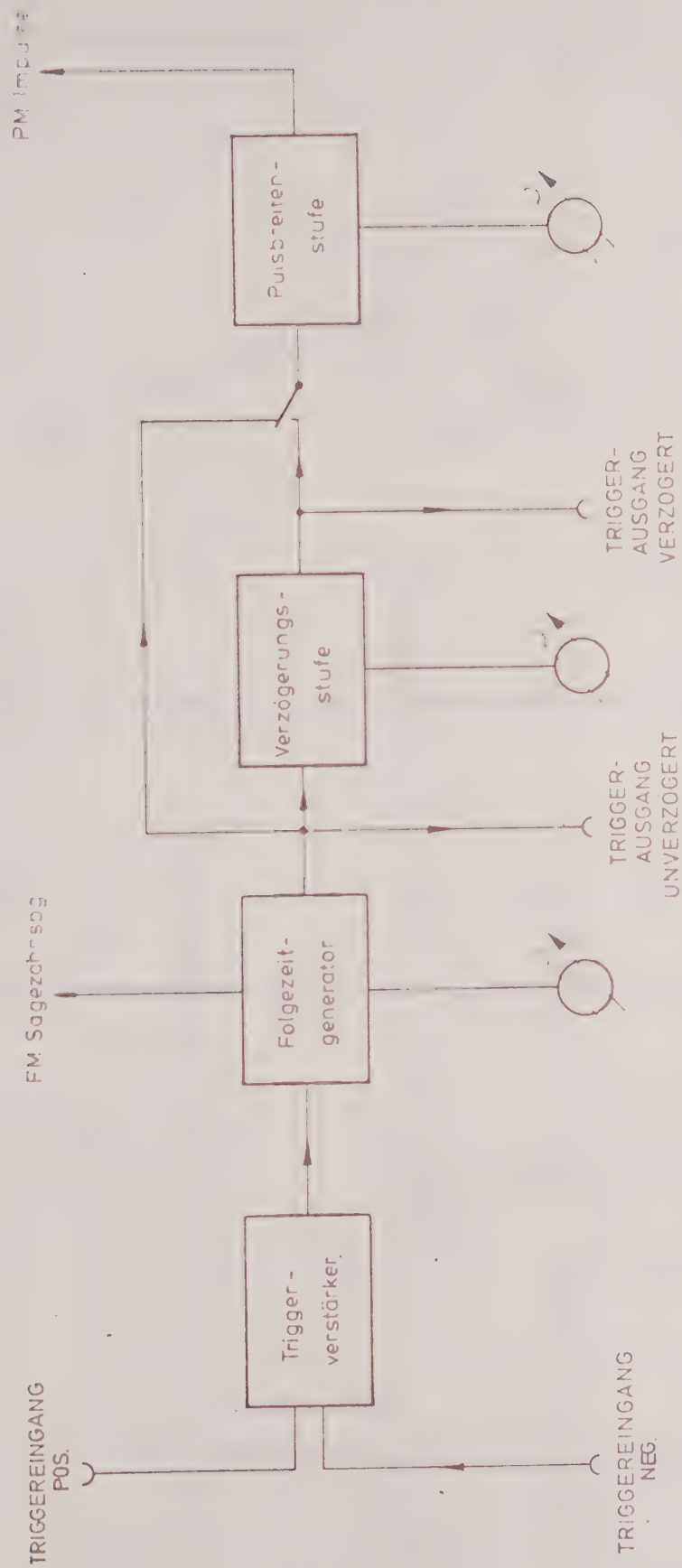


Bild 20 Blockschaltbild des Modulationseinschubes

Triggereingang



Sägezahn Ausgang



Triggerausgangsimpulse
unverzögert



Triggerausgangsimpulse
verzögert



Ausgangsimpulse
unverzögert



Ausgangsimpulse
verzögert



t_f = Folgezeit, t_v = Verzögerungszeit, t_p = Impulsbreite

Bild 21 Impulssdiagramm des Modulationseinschubes

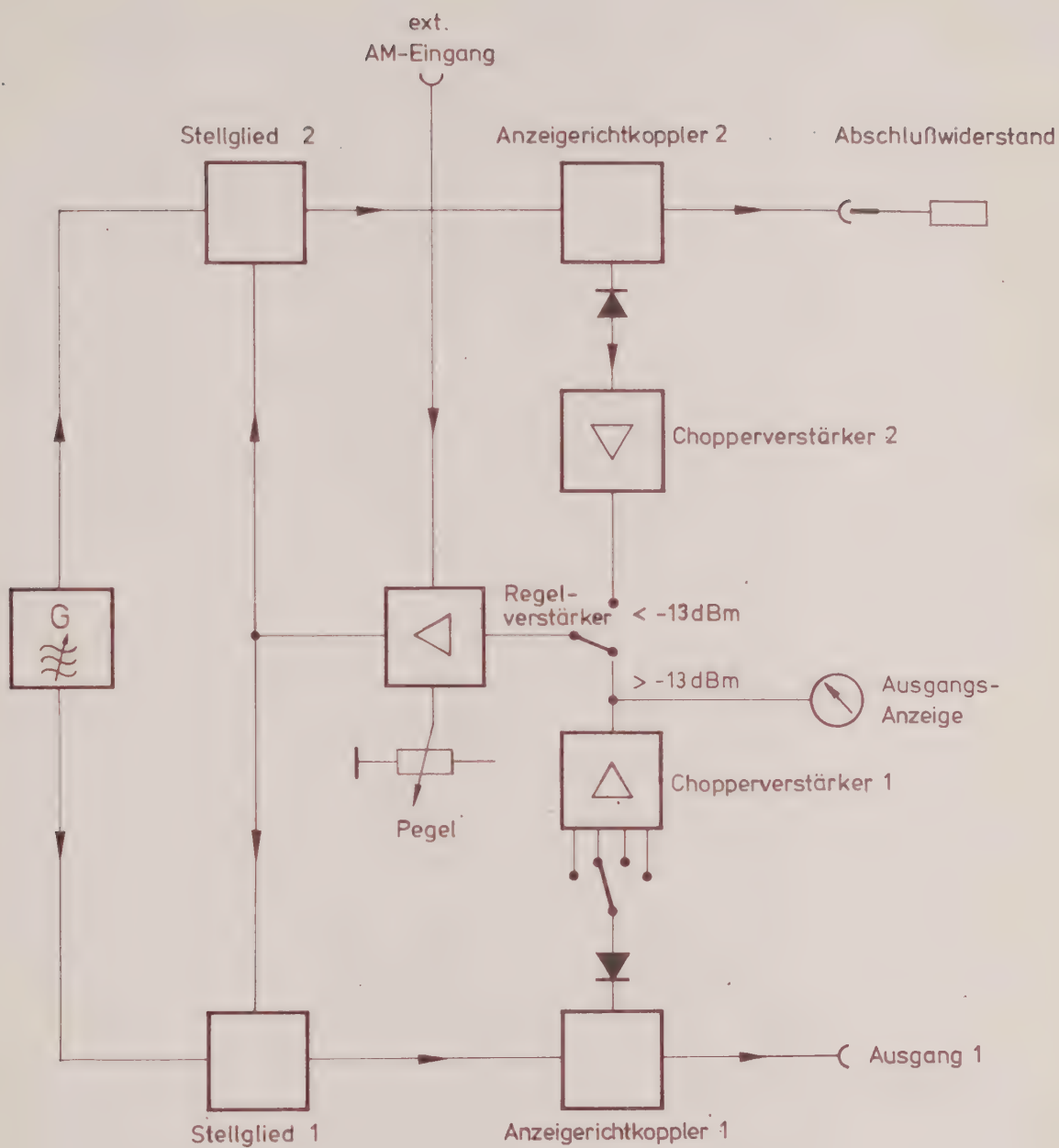


Bild 22 Blockschaltbild der Ausgangsleistungsregelung

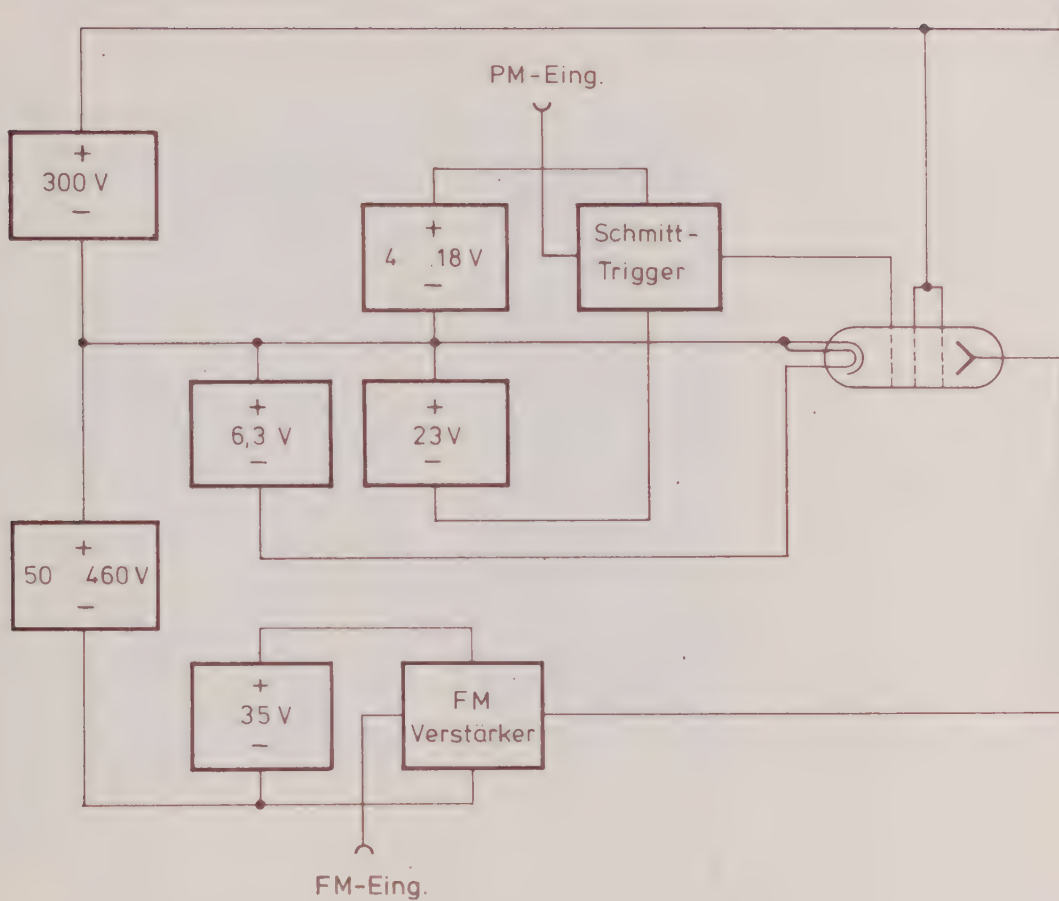


Bild 24 Blockschaltbild der Spannungsversorgung

FM-Verstärker 41422-1.76

Schmitt-Trigger 41420-1.90.20

1-kHz-Generator 41420-53

Chopper-Verstärker 1 41420-5

Chopper-Verstärker 2 41420-5
(nur bei BN 414202)

Regelverstärker 414222-20
(nur bei BN 414202)

20-V-Regelteil 41422-41

23-V-Regelteil 41422-44

4...18-V-Regelteil 41422-43

35-V-Regelteil 41422-42

50...450-V-Regelteil 41420-51

6,3-V-Regelteil 41422-45

300-V-Regelteil 41422-47

Reflektorspannungseinstellung

Bild 25 Lage der Baugruppen, Meß- und Abgleichpunkte (Oberseite)

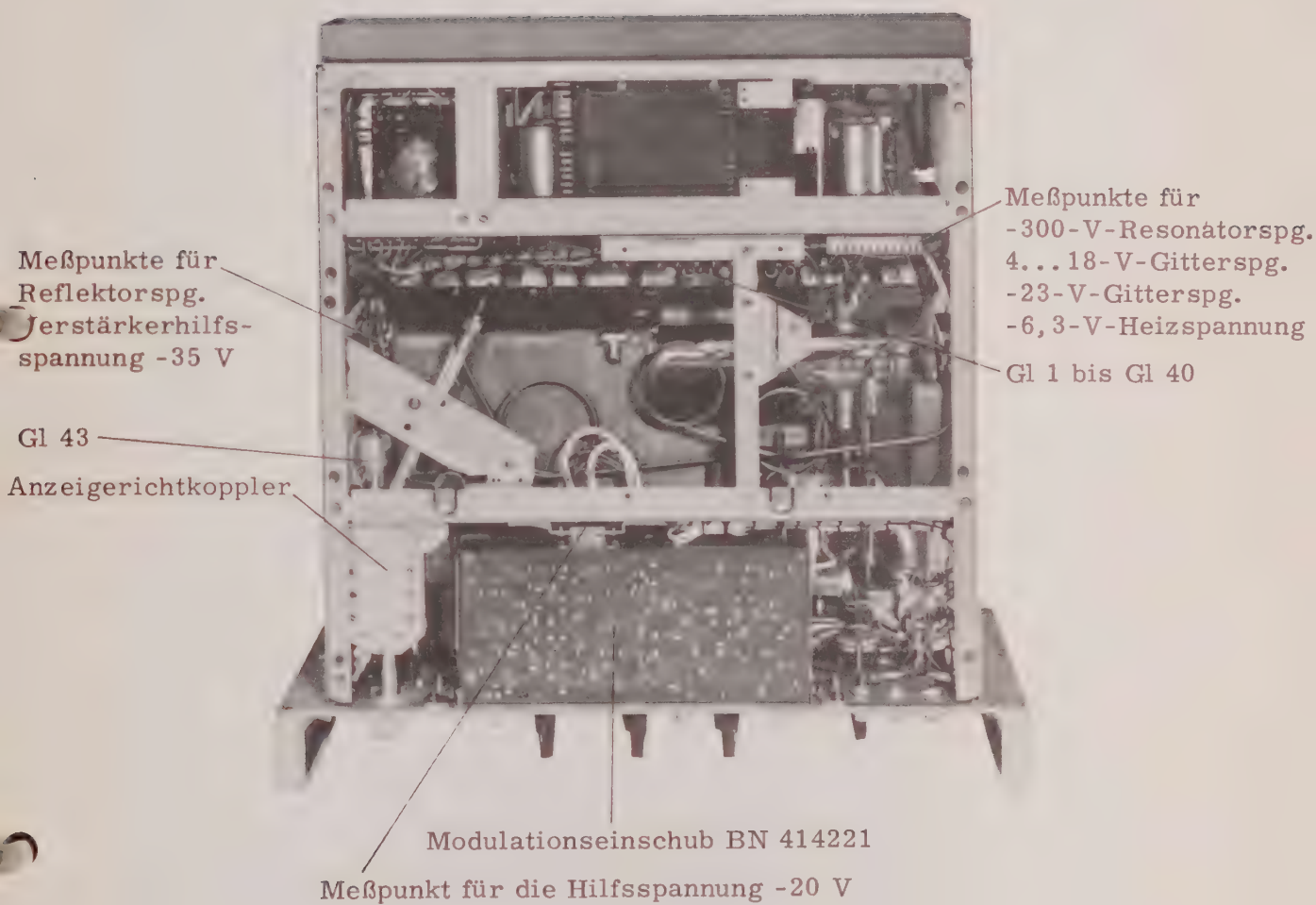
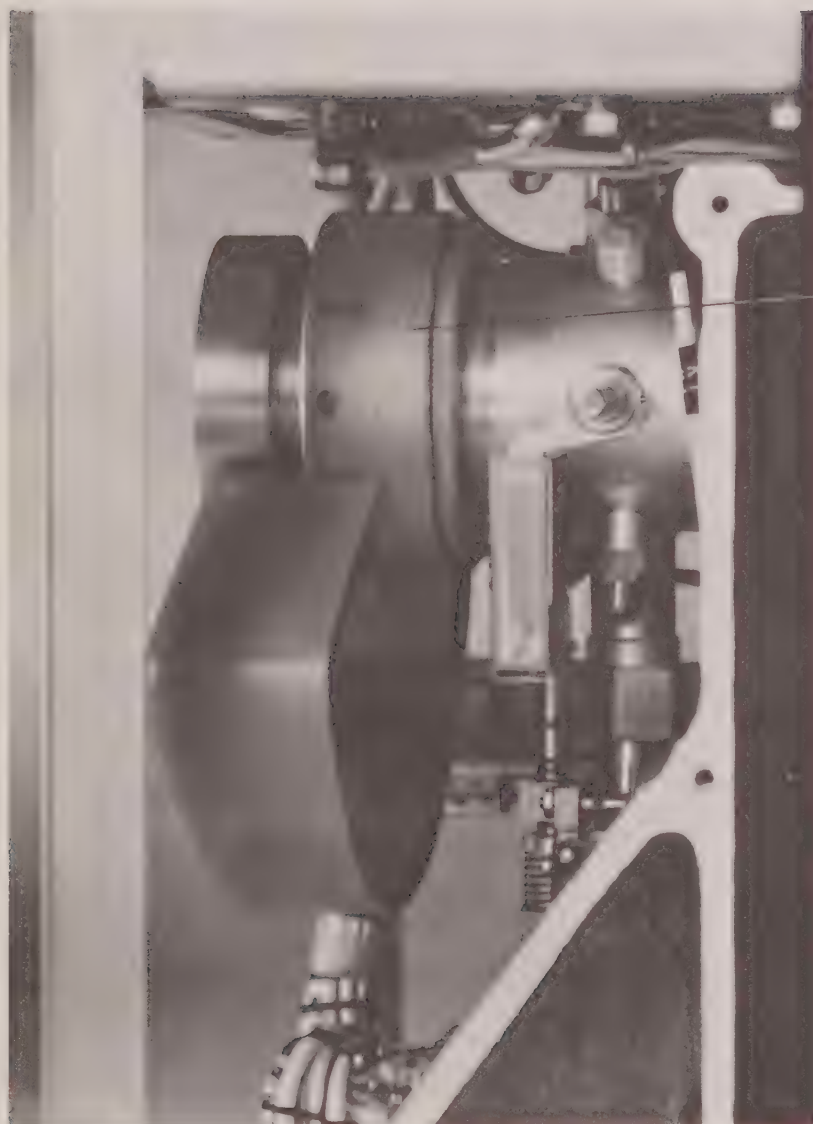


Bild 26 Lage der Baugruppen, Meß- und Abgleichpunkte (Unterseite)



Rändelmutter
zum Öffnen
nach links drehen

Bild 27 Klystron

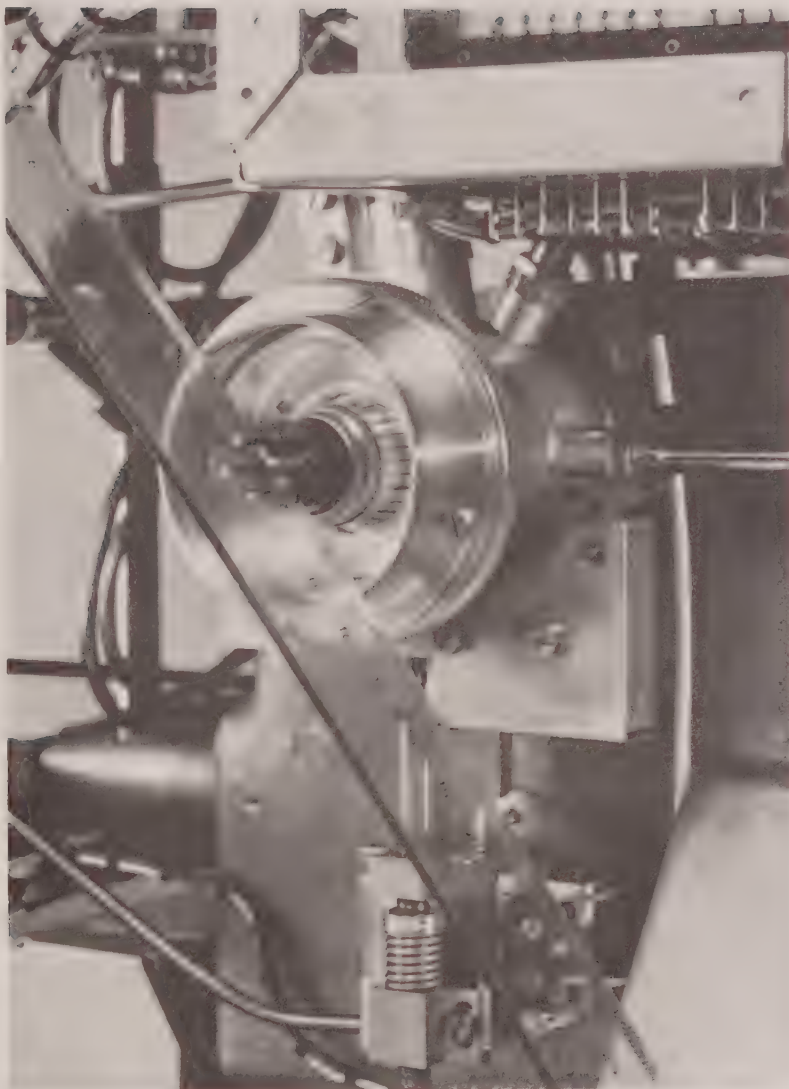
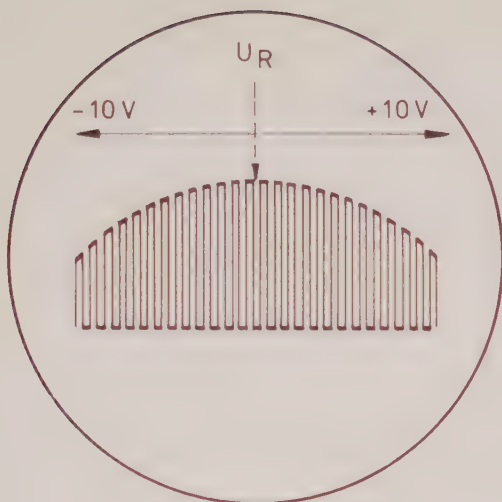
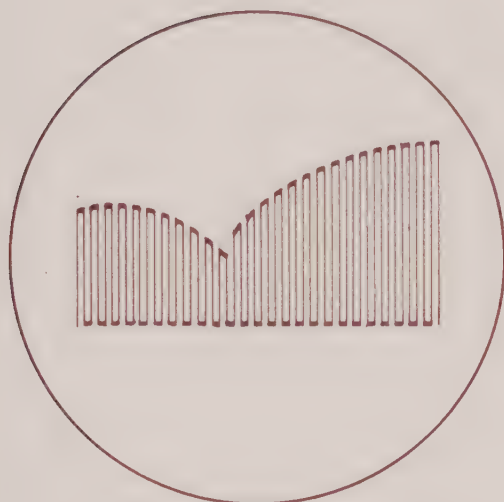


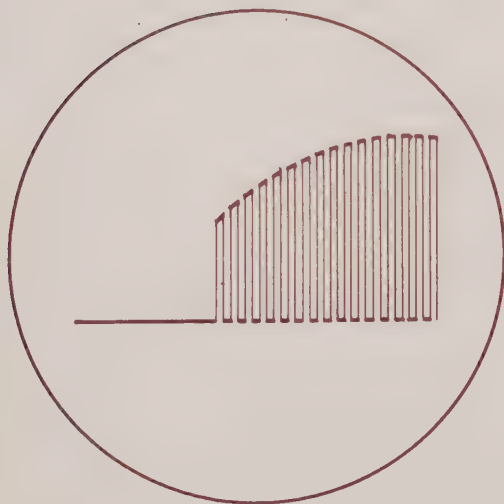
Bild 28 Einstellen des Gewinderinges an der Klystronfassung



a) richtige Einstellung
der Reflektorspannung



b) falscher Schwingmodus
im Bereich durch
falsche Einstellung
der Reflektorspannung



c) Abreißen der Schwingung
durch falsche Einstellung
der Reflektorspannung

Bild 29 Oszillogramme zum Einstellen der Reflektorspannung

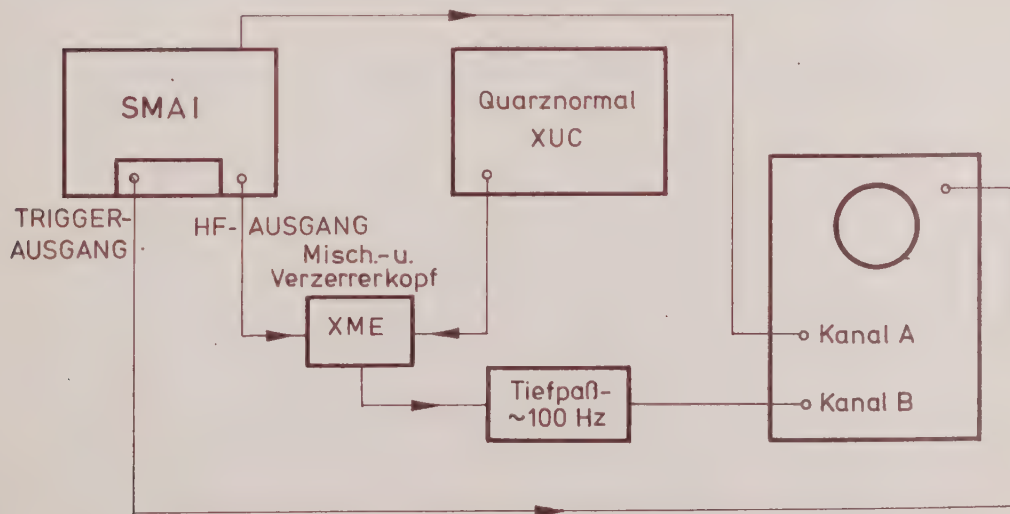
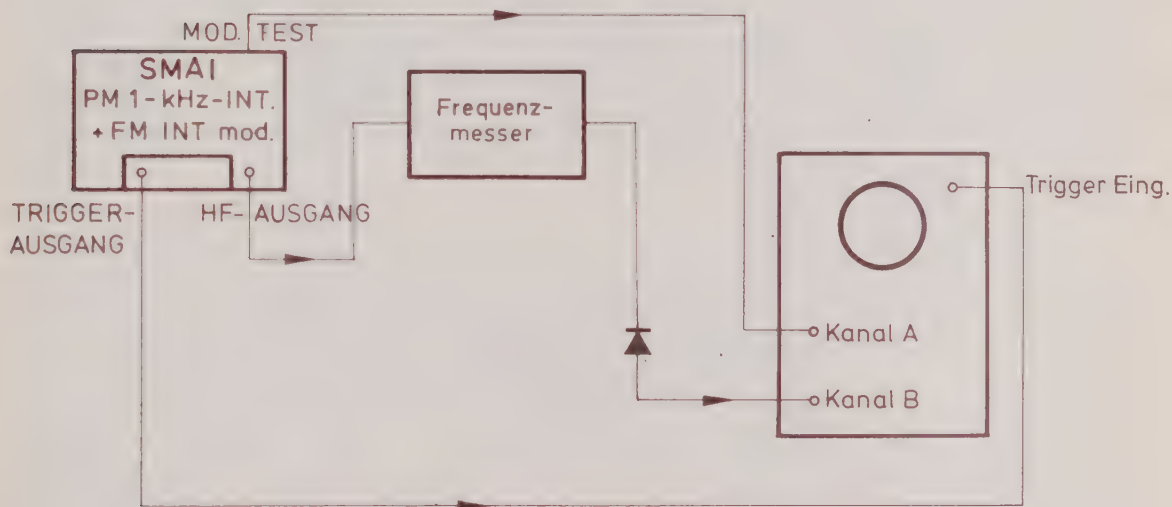
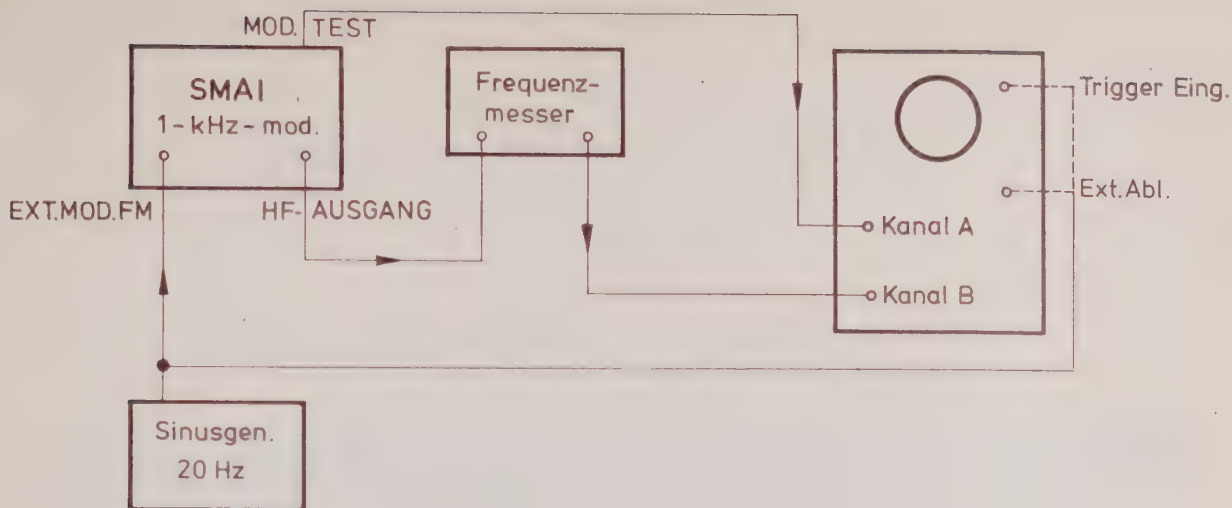


Bild 30 Blockschaltbilder zur Frequenzeinstellung

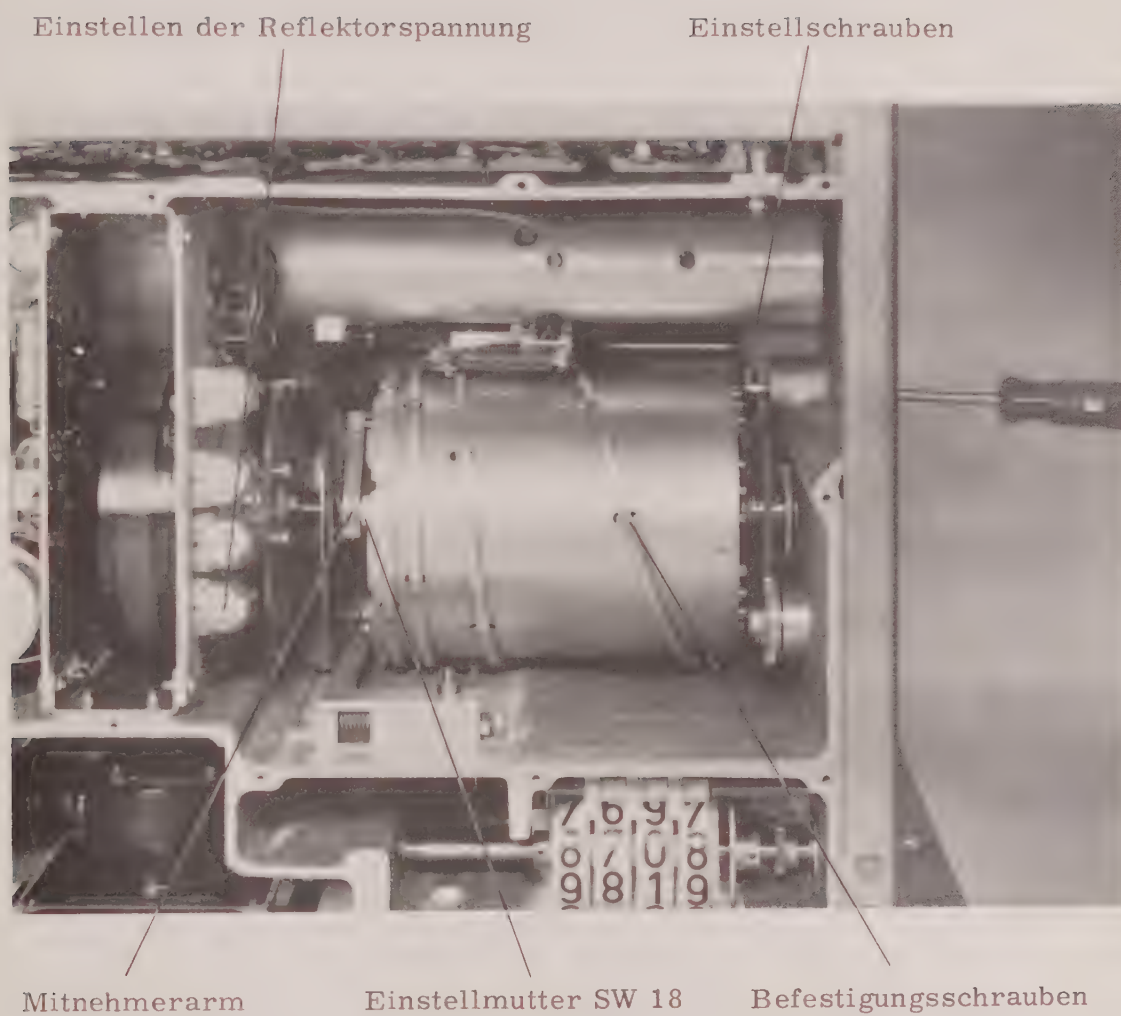


Bild 31 Einstellen der Frequenzabstimmung

Supplement
to Instruction Book UHF Signal Generator Type SMAI
Compiled from R 16009

Amendments to circuit diagrams and parts lists:

41420 Sa Bl. 2, 414202 Sa Bl. 2

The paper capacitor C23 with the R&S Stock No. CPK 66003 n 10 has been added.

The paper capacitor C24 with the R&S Stock No. CPK 70003 n 1 has been added.

41420 S, 414202 S

Capacitor C24 with the value of 1 nF comes between Y11 (1) and chassis.

Capacitor C23 with the value of 10 nF comes between Y11 (2) and chassis.

41420-1.90.20 S and Sa Bl. 1

The ceramic capacitor C1109 has the new value of 220 pF and the new R&S Stock No. of CCG 91/220.

41422-45 Sa Bl. 1

The tantalum electrolytic capacitor C806 with the value 4.7 μ V and the R&S Stock No. CEV 41423 u 4,7 has been added.

41422-45 S

The tantalum electrolytic capacitor C806 with the value 4.7 μ F is between connections St801.1 and St801.2, the positive pole being at St801.2.

Standard Translations for Parts Lists

For Translations Not Included in this List See Supplement

Abgesch. Leitung	Shielded lead
Abgesch. Schuttdraht	Shielded jumper wire
Abgleichkondensator	Trimmer
Abgreifb. Drahtwiderstand	Tapped wire-wound resistor
Ablenkspule	Deflection coil
Ablenkverstärker	Amplifier
Abschirmleitung	Shielded line
Abschlußwiderstand	Terminator
Achse gek. auf L	Shaft shortened to L
Achs-L	Length of shaft
Amphenol-Buchse	Amphenol socket
Änd.-Zust.	Modification
Anodendrossel	Anode choke
Anodenspannung	Anode voltage
Anodenspule	Anode coil
Anodentrafo	Anode transformer
Anreihklemme	Add-on terminal strip
Anschlußkabel	Connecting cable
Anschlußplatte	Connecting plate
Antennenbuchse	Antenna socket
Antennenschalter	Antenna switch
Antennenumschalter	Antenna switch
Anzeigelampe	Indicating lamp
Ausgangsübertrager	Output transformer
Bandfilterspule	Band-pass filter coil
Band-Kabel	Twin lead
Bandpaßspule	Band-pass filter coil
Batteriekabel	Battery cable
Begrenzerspule	Limiting coil
beim Skalenwert	At scale reading
Bemerkungen	Remarks
Benennung	Designation
Bereichsschalter	Range switch
Bereichsspule	Range coil
Betriebsartenschalter	Function selector
Bildröhre	Picture tube
Blindstecker	Dummy plug

Bolzen	Bolt
Buchse	Socket
Buchsenelement	Female connector
Buchsenleiste	Female multipoint connector
Bügel	Link
Chopper-Verstärker	Chopper amplifier
Cu-Schalt draht, abgesch.	Shielded copper wire
Dämpfungsplättchen	Attenuator
Dämpfungswiderstand	Attenuator
Dekadenschalter	Decade switch
Df-Filter	Lead-through filter
Df-Kondensator	Feed-through capacitor
Differenzierspule	Coil
Diskriminatorspule	Discriminator coil
Doppelleitung	Twin line
Doppel-Schichtdrehwiderstand	Variable twin depos.-carbon resistor
Doppeltriode	Twin triode
Drahtdrehwiderstand	Variable wire-wound resistor
Drahtwiderstand	Wire-wound resistor
Drehfeldsystem	Synchro system
Drehkondensator	Variable capacitor
Drehschalter	Rotary switch
Drehspulinstrument	Moving-coil meter
Drehspul-Spannungsmesser	Moving-coil voltmeter
Drehspul-Strommesser mit Gleichrichter in Grätzschaltung	Moving-coil meter with bridge-type rectifier
Drossel	Choke
Drosselleitung	Choke
Drucklüfter	Blower
Drucktaste	Push button
Duo-Diode	Duodiode
Duo-Triode	Duotriode
Durchführungsbuchse	Feed-through socket
Durchführungsfilter	Lead-through filter
Durchführungs-Kondensator	Feed-through capacitor
Eichoszillator	Reference oscillator
Einbaubuchse	Fixed socket
Einbaustecker	Fixed connector
Eingangsspule	Input coil
Eingangsübertrager	Input transformer
einzusetzen in Gerät Type ...	To be inserted into Type ...

Elektrolyt-Kondensator

ELKO

End-Pentode

Entbrummer

entfällt

enthalten in ...

enth. in ...

Entzerrerdrossel

Erdklemme

etwa

Filterquarz

Filterspule

Flachgleichrichter

Flachrelais

Flanschdose

Frequenzbereichschalter

Frontansicht

Frontplatte

Gabel-Kippschalter

Gebläse

Ge-Diode

Germaniumdiode

Ge-Gleichrichter

Generatorspule

Gerätebuchse

Gerätekupplung

Gerätestecker

Gitterkreisspule

Gleichrichter

Gleichstromrelais

Glimmer-Kondensator

Glimmlampe

Glimmstabilisator

Glühlampe

Gr.

Gruppe

Heißleiter

Heizdrossel

Heizkörper

Heiztrafo

Heizwiderstand

3
Electrolytic capacitor

Electrolytic capacitor

Output pentode

Hum potentiometer

Not provided

Included in ...

Included in ...

Choke

Earth terminal

Approx.

Filter crystal

Filter coil

Rectifier

Flat-type relay

Flange socket

Frequency-range selector

Front view

Front panel

Toggle switch

Blower

Germanium diode

Germanium diode

Germanium rectifier

Generator coil

Fixed receptacle

Coupling

Free receptacle

Grid-circuit coil

Rectifier

DC relay

Mica capacitor

Glow lamp

Reference tube

Incandescent lamp

Subassembly

Subassembly

Thermistor

Heater choke

Heater

Heater transformer

Heater resistor

HF-Buchse	RF socket
HF-Filterspule	RF filter coil
HF-Kabel	RF cable
Hochfrequenzkabel	RF cable
HF-Kippschalter	RF toggle switch
HF-Relais	RF relay
HF-Spule	RF coil
HF-Teil	RF section
HF-Übertrager	RF transformer
HF-Umschalter	RF switch
hierzu bes. Stromlauf, Schaltteil- liste und Stückliste	See separate circuit diagram and parts lists
Hochpaßspule	High-pass filter coil
Hochspannungsgleichrichter	HT rectifier
Hochspannungstrafo	HT transformer
Impulstransformator/Impulsübertrager	Pulse transformer
in Serie	In series
Isolator	Insulator
isoliert eingebaut	Insulated
Kabel	Cable
Kabelbuchse	Cable socket
Kabelstecker	Cable connector
Kaltkathodenröhre	Cold-cathode valve
Kammrelais	Relay
Kapazitätsdiode	Varactor
Katodendrossel	Cathode choke
Katodenstrahlröhre	Cathode-ray tube
Kennzeichen	Ref. No.
Keramikkondensator	Ceramic capacitor
Keramik-Rohrtrimmer	Tubular ceramic trimmer
Keramikspule	Ceramic coil
Keramische Durchführung	Ceramic feed-through
Keram. Scheibentrimmer	Ceramic disc trimmer
Ker- Bp.-Kondensator	Ceramic bypass capacitor
Ker. Df-Kondensator	Ceramic feed-through capacitor
Ker- Waffelkondensator	Ceramic wafer capacitor
Kippschalter	Toggle switch
Klatschkondensator	Bypass capacitor
Klein-Flanschdose	Receptacle with multisocket insert
Kleinkondensator	Miniature capacitor

Kleinkupplungsstecker	Small connector plug
Kleinlampe	Midget lamp
Kleinrelais	Miniature relay
Kleinstufenschalter	Midget rotary switch
Klemmleiste	Terminal strip
Kompensationsspannung	Balancing voltage
Kondensator-Aggregat	Capacitor assembly
Konstanthalter	Stabilizer
Kontaktfeder	Contact spring
Kontaktleiste	Multipoint connector
Koppelkondensator	Coupling capacitor
Koppelschleife	Coupling loop
Koppelspule	Coupling coil
Koppeltrimmer	Coupling trimmer
Kupplungskondensator	Coupling capacitor
Korrektions-Kondensator	Correction capacitor
Korrektionstrimmer	Correction trimmer
Kreisspule	Circuit coil
Kristall-Diode	Crystal diode
Kristall-Gleichrichter	Crystal rectifier
Ks-Kondensator	Plastic-foil capacitor
Kunstfolienkondensator	Plastic-foil capacitor
Kurzhubstecker	Short-stroke connector
Kurzschließer	Shorting link
Kurzschlußstecker	Shorting plug/ Shorting bar
Lackfolienkondensator	Film capacitor
Lackkondensator	Film capacitor
Laufzeitkette	Delay line
Lautsprecher	Loudspeaker
Leistungspentode	Power pentode
Leitung geschirmt	Shielded cable
Leitungskreis	Transmission line
Leuchtstoff-Glimml.	Luminescent glow lamp
Leuchttaster	Illuminated pushbutton
Liste besteht aus ... Blatt	List consists of ... pages
Luftabgleichkondensator	Air trimmer
Luftblockkondensator	Air capacitor
Luftdrehkondensator	Variable air capacitor
Luftfilter	Air filter
Luftwimmer	Air trimmer
Lüfter	Blower

Magnetspule	Magnet coil
Meßbereichschalter	Range switch
Meßgleichrichter	Meter rectifier
Meßimpulsverzögerung	Test-pulse delay
Meßschalter	Check switch
Meßtransformator	Precision transformer
Meßverstärker	Meter amplifier
Mikrofonkabel	Microphone cable
Mikroschalter	Micro switch
mit Isolier-Zubehör	With insulating accessory
mit Skala nach ...	With scale according to ...
Motorrelais	Motor relay
MP-Kondensator	MP capacitor
MP-Motorkondensator	MP motor capacitor
Nachstimmeinheit	Tuning unit
Nachstimm-Kondensator	Trimming capacitor
Nebenwiderstand	Shunt resistor
Netz	AC supply
Netzdrossel	Power choke
Netzgerät	Power supply
Netzgleichrichter	Power rectifier
Netzkabel	Power cable
Netzschalter-Kombination	Power switch assembly
Netzteil	Power supply
Netztrafo	Power transformer
Netztransformator	Power transformer
Netzübertrager	Power transformer
NF-Schaltung	AF circuit
Nockenschalter	Cam switch
Normalkondensator	Standard capacitor
Örtliche Lage im Gerät	Location in the set
Oszillatorspule	Oscillator coil
Oszillographenröhre	Cathode-ray tube
Papier-Df-Kondensator	Feed-through paper capacitor
Papierkondensator	Paper capacitor
16-polig	16-pole
Potentiometer	Potentiometer
Präzisionsdrehwiderstand	Variable precision resistor
Projektionslampe	Projector lamp
Prüffeld	Test department
Prüfspannung	Test voltage

Quarz
 Quarz-Anodenspule
 Quarzbandfilter
 Quarzfassung
 Quarzfilter
 Quarzthermostat
 Quetschkondensator
 Rahmenkontakt
 Rahmenkreisspule
 Rahmenspule
 Referenz-Element
 Regellampe
 Regelteil
 Reihenklemme 2 teilg.
 Relais
 Resonanzübertrager
 Ringspule
 Röhre
 Rohrkondensator
 Rohrkreis
 Rückansicht
 Rundkondensator
 Rundrelais
 R&S-Sach-Nr.
 Sach-Nr.
 Saugkreisspule
 Schaltbuchse
 Schalt draht
 Schaltebene
 Schalteraggregat
 Schaltkapazität
 Schaltsatz
 Schaltscheibe
 Schalteilliste
 Scheibenschalter
 Scheibentrimmer
 Scheibentriode
 Schicht-Drehwiderstand
 Schichtwiderstand
 Schiebeschalter
 Schirmleitung

Crystal
 Crystal anode coil
 Crystal bandpass filter
 Crystal holder
 Crystal filter
 Oven
 Bypass capacitor
 Loop antenna contact
 Loop circuit coil
 Loop coil
 Reference element
 Pilot lamp
 Stabilizer
 2-point terminal strip (or block)
 Relay
 Resonance transformer
 Toroidal coil
 Valve (US: tube)
 Tubular capacitor
 Tubular circuit
 Rear view
 Round capacitor
 Round relay
 R&S Stock No.
 Stock No.
 Trap coil
 Socket (with switching contact)
 Jumper
 Switch deck
 Switch assembly
 Circuit capacitance
 Switch assembly
 Wafer
 Parts list
 Wafer switch
 Disc trimmer
 Disc-seal triode
 Variable depos.-carbon resistor
 Depos.-carbon resistor/ Film resistor
 Slide switch
 Shielded wire

Schmelzeinsatz	Fuse
Schmelzsicherung	Fuse
Schutz	Contacteur
Schutzschaltung	Protective circuit
Schwingkreisspule	Tank-circuit coil
Schwingquarz	Oscillator crystal
Schwingspule	Oscillator coil
Schwingübertrager	Transformer
Selengleichrichter	Selenium rectifier
Sicherung	Fuse
Si-Diode	Silicon diode
Silizium-Diode	Silicon diode
Si-Gleichrichter	Silicon rectifier
Signalglühlampe	Pilot glow lamp
Signallampe	Pilot lamp
Si-Kapazitäts-Diode	Silicon capacitor
Skalenendwert	Full-scale value
Skalenlampe	Scale lamp
Soffittenlampe	Tubular lamp
Sonde	Probe
Spannungsteiler	Voltage divider
Spannungswähler	Tapping panel (Fuse strip)
Spannungswandler	Voltage transformer
Spitzendiode	Point-contact diode
Spule	Coil
Spulenschalter	Coil switch
Stabilisator	Reference tube
Stabrelais	Thermal mercury relay
Starkstromklemme	Power terminal
Steckdose	Socket
Stecker	Plug
Steckerleiste	Male multipoint connector
Steckgleichrichter	Plug-in type rectifier
Steuerquarz	Oscillator crystal
Stift	Pin
Stiftkondensator	Pin capacitor
Strommesser	Meter
Stromversorgungskabel	Power cable
Stromwandler	Current transformer
Stückzahl	Quantity
Stufenschalter	Rotary switch

Tantal-Elko
 Teiler-Kondensator
 Teilerschalter
 Teilerwiderstand
 Telefonbuchse, isol.
 Thermokontakt
 Thermo-Relais
 Thermoschalter
 Thermostat-Quarz
 Thermostattrafo
 Tiefpaßspule
 TP-Filterspule
 Transistorpaar
 Trimmwert
 Trockenelement
 Tucheldose
 Trenntrafo
 Tiefpass
 Trimmer
 Trocken-Batterie
 Übertrager
 Umrüstbuchse, isol.
 Umrüst-Dezifix
 Umschalter
 Umschaltklemme
 Umschaltplatte
 Vario-Diode
 Variometer
 Varistor
 Ventilator
 Verbindungskabel
 Verbindungsflasche
 Verbindungsstück
 verdrahtet nach ...
 verdrillt
 Verdrosslung
 Verklatschungskondensator
 Voreingest. auf
 Vorübertrager
 Varactor-Diode

Electrolytic tantalum capacitor
 Attenuator capacitor
 Attenuator switch
 Divider resistor
 Floating telephone jack
 Thermal contact
 Thermal relay
 Thermal switch
 Crystal (thermostat)
 Thermostat transformer
 Low-pass filter coil
 Low-pass filter coil
 Pair of transistors
 Factory-adjusted
 Dry cell
 Tuchel-type socket
 Isolating transformer
 Low-pass filter
 Trimmer
 Dry battery
 Transformer
 Floating adaptable socket
 Adaptable Dezifix
 Switch
 Voltage selector
 Switching panel
 Varactor
 Variometer
 Varistor
 Blower
 Patch cord
 Connection link
 Connection cable
 Wired according to
 Twisted
 Choke
 Bypass capacitor
 Factory-adjusted to
 Transformer
 Varactor

Wechselstromrelais

AC relay

Wert

Ratings

Winkelstecker

Angle connector

Winkelstück

Angle section

Zenerdiode

Zener diode

Zerhacker

Vibrator

Zerhackertrafo

Vibrator transformer

ZF-Filterspule

IF filter coil

ZF-Teil

IF section

Zusatzspule

Additional coil

Zwergglühlampe

Miniature glow lamp

Supplement to Standard Translations for Parts Lists

Auskoppelkondensator	Coupling-out capacitor
Buchsenteil	Special connector
Dezifixanschluß	Dezifix connector
Durchführung	Lead-through
FM-Verstärker	FM amplifier
hierzu bes. Stückliste	See sep. parts list
Induktivität	Coil, inductance
je nach Auftrag	According to order
Kabel, kapazitätsarm	Cable, low capacitance
Kf-Kondensator	Synth.-foil capacitor
MKT-Kondensator	Metallized, synthetic-foil capacitor
Modulationseinschub	Modulator unit
Präzisions-Draht-Drehwiderstand	Resistor, wire-wound prec.
Reflektorautomatik	Automatic reflector tuner
Reflektorspannungsdrossel	Reflector voltage choke
Reflex-Klystron	Reflex klystron
Regelteil	Stabilizing circuit
Regelverstärker	ALC amplifier
Resonatorspannungsdrossel	Resonator voltage choke
Scheibenwiderstand	Disc-type resistor
SHF-Empfänger-Meßsender	SHF signal generator
Si-Mikrowellen-Diode	Silicon microwave diode
Steckerteil	Plug fitting
Tiefpaß	Low-pass filter
Turbogebläse	Turbo blower

Translations for Drawings and Diagrams

Anzeigebereich	Indication range
Ausg.	Output
Ausg. (Reflektor)	Output (reflector)
Ausgangsleistung	Output power
Ausgangsteiler	Output attenuator
Ausgang unverz.	Output undelayed
Ausgang verz.	Output delayed
Automatische Umschaltung von S11 (in Stellung NO) bei ca. 17 dBm Teilerschaltung	S11 is automatically (in position NO) at approx. 17 dBm attenuation
Chopper-Verstärker	Chopper amplifier
Eing.	Input
FM-Hub	FM deviation
FM-Verstärker	FM amplifier
Folgezeit	Repetition time
Folgezeit-Generator	Repetition time generator
Frequenz	Frequency
Frontpl.-Symbol	Front panel symbol
für Vollausschlag Instrument	Full deflection of meter
ge	Yellow
geg. ...	With respect to ...
gn	Green
Gold-Stirnfläche	Gold-front face
Gr.	Subassembly
HF aus	Standby
HF-Ausgang	RF output
hierzu Schaltteilliste	See parts list

Impulsdauer	Pulse width
kapazitätsarme Leitung	Low-capacitance lead
Leistungsregler	Power control
mechanisch gekuppelt; die Umschaltung auf NO erfolgt bei einem R1301-Drehwinkel von 105° (von 0° aus geordnet) entspr. 3,3 GHz	Mechanically coupled; switching to NO carried out with R1301 at an angle of rotation of 105° (referred to 0°), corresponding to 3.3 GHz
Meßpunkt	Test point
Mod. Eing.	Mod. input
Modulationseinschub	Modulation unit
ms	msec
NC geschlossen in Stellung ...	NC closed in position ...
Pulsbreite	Pulse width
Reflektorautomatik	Automatic reflector tuner
Regeleing.	Control input
Regelkoppler	Control coupler
Regelspannung	Control voltage
Regelteil	Stabilizing circuit
Regelverstärker	ALC amplifier
Rö	Valve
rt	Red
Sägezahn-Verstärker	Sawtooth amplifier
Schleiferfeder auf Seite der Verdrehungsschutz Nase (Kondensatoren nach Einschuboberseite)	Wiper spring on side of torsion guard (capacitors toward top of unit)
SHF-Empfänger-Meßsender	SHF signal generator
Signal-Glimmlampe	Pilot glow lamp
siehe Stromlauf	See circuit diagram
Stromlauf besteht aus 2 Blatt	Circuit diagram consists of 2 pages

Stromlauf zu	Circuit diagram for
sw	Black
Synchr. Eing.	Synch. input
Triggerausgang	Trigger output
Trigger-Ausgangs-Verstärker	Trigger output amplifier
Triggereingang	Trigger input
Trigger-Eingangs-Verstärker	Trigger input amplifier
Umschaltung von NC auf NO in Abhängigkeit vom R1301-Drehwinkel (von 0° aus gerechnet) bei ...	Switching from NC to NO depends on angle of rotation of R1301 (starting with 0°) at ...
UN	CW
unverzögert	Undelayed
verzögert	Delayed
Verzögerung	Delay section
V_{ss}	V_{pp}
Zeichn. Nr.	Drawing No.
zur Aufnahme eines zusätzlichen Chopper-Verstärkers bei der geregelten Ausführung	For accepting additional chopper amplifier with controlled version
zur Aufnahme eines Regelver- stärkers bei der geregelten Ausführung	For accepting ALC amplifier with controlled version
zur Erweiterung auf geregelte Ausführung (Leitungsverlauf siehe ...)	For extension to controlled version (for connections see ...)

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

KZ KZ Kenn- zeichen	Stück- zahl	Benennung	Sach-Nr.		Bemerkungen
1	2	3	4	5	6
Bu1		Dezifix A (Gruppe)	FNA 4000/50 - 1		hierzu bes. Stückliste
Bu2		Dezifixanschluß (Gr.)	356373 - 75		hierzu bes. Stückliste
Bu3		Büchse	FUN 10240		
Bu4		Gerätebuchse	FHM 14041/50		
Bu5		Gerätebuchse	FHM 14041/50		
Bu7		Gerätebuchse	FHM 14041/50		
Bu8		Gerätebuchse	FHM 14041/50		
Bu101		Buchsenleiste	FUL 51441		
Bu201		Buchsenleiste	FUL 51441		
Bu301		Buchsenteil	41422 - 2.4		
Bu401		Buchsenleiste	FUL 51441		
Bu501		Buchsenleiste	FUL 51441		
Bu601		Buchsenleiste	FUL 51441		
Bu701		Buchsenleiste	FUL 51441		
Bu801		Buchsenleiste	FUL 51441		
Bu901		Buchsenleiste	FUL 51441		
Bu1001		Buchsenleiste	FUL 51441		
Bu1201		Buchsenleiste	FUL 51440		

 ROHDE & SCHWARZ MÜNCHEN			Änd.- zust.	Änd.-Mitgl. Nr.	Datum	Name	Liste Nr. 414202 Sa	Liste besteht aus 12 Blatt Blatt Nr. 1
1 CDE	Datum	Name						
geschrieben	19.9.67	Volk						
bearbeitet		Volk						
geprüft	25.10.67	BE						
normgeprüft								
			Ersatz für Liste Ersatzliste! Schalterliste zu UHF-Empfänger-Meßsender 500...1800 MHz Type SMAI					

Vervielfält.-Pause Nr.

Arbeitspause Nr.

1	2	3	4	5	6
C21		Elko	CEE 21/500/100		
C22		Elko	CEE 21/500/100		
C29		Papier-Kondensator	CPK 70003 n 2,2		
C31		Df-Kondensator			>25pF; Pspg. max. 4,5V- (Diode!); enth. in 41420 - 32
C32		Df-Kondensator			>25pF; Pspg. max. 4,5V- (Diode!); enth. in 41420 - 32
C33		Df-Kondensator			enth. in 414202 - 1
C34		Df-Kondensator			enth. in 414202 - 1
C35		Df-Kondensator			enth. in 414202 - 1
C36		Df-Kondensator			enth. in 414202 - 1
D 1		Tiefpaß (Gruppe)	41420 - 1.85		hierzu bes. Stückliste
D 2		Tiefpaß (Gruppe)	41420 - 1.85		hierzu bes. Stückliste
D 3		Tiefpaß (Gruppe)	41420 - 1.85		hierzu bes. Stückliste
D 4		Tiefpaß (Gruppe)	41420 - 1.74.3		hierzu bes. Stückliste
D 5		Tiefpaß (Gruppe)	41420 - 1.85		hierzu bes. Stückliste
D 6		Tiefpaß (Gruppe)	41420 - 1.85		hierzu bes. Stückliste


ROHDE & SCHWARZ
 MÜNCHEN

1 CDE	Datum	Name
geschrieben	19.9.67	Volk
bearbeitet		Volk
geprüft		BC
normgeprüft		

Änd.- zust.	Änd.-Mittig Nr.	Datum	Name

Liste Nr.

414202 Sa

Liste besteht
aus Blatt

Blatt Nr. 3

Ersatz
für Liste

UHF-Empfänger / Schalttafel zu

UHF-Empfänger-Meßsender 500...1800 MHz
Type SMAI

Diese Zeichnung ist unser Eigentum. Vervielfältigung,
 unbefugte Verwertung, Mitteilung an andere ist
 strafbar und schadenersatzpflichtig.

ervielfält.-Pause Nr.

Arbeitspause Nr.

Diese Zeichnung ist unser Eigentum. Vervielfältigung,
unbefugte Vervielfältigung, Mitteilung an andere ist
strafbar und schadenersatzpflichtig.

MR XX Kenn- zeichen	Stück- zahl	Benennung	Sach-Nr.		Bemerkungen
1	2	3	4	5	6
G115		Kristall-Gleichricht.	GK/0302		
G116		Kristall-Gleichricht.	GK/0302		
G117		Kristall-Gleichricht.	GK/0302		
G118		Kristall-Gleichricht.	GK/0302		
G121		Kristall-Gleichricht.	GK/0302		
G122		Kristall-Gleichricht.	GK/0302		
G123		Kristall-Gleichricht.	GK/0302		
G124		Kristall-Gleichricht.	GK/0302		
G125		Kristall-Gleichricht.	GK/0302		
G126		Kristall-Gleichricht.	GK/0302		
G127		Kristall-Gleichricht.	GK/0302		
G128		Kristall-Gleichricht.	GK/0302		
G131		Kristall-Gleichricht.	GK/SiD 01 NN		
G132		Kristall-Gleichricht.	GK/SiD 01 NN		
G133		Kristall-Gleichricht.	GK/SiD 01 NN		
G134		Kristall-Gleichricht.	GK/SiD 01 NN		
G137		Kristall-Gleichricht.	GK/0302		
G138		Kristall-Gleichricht.	GK/0302		
G139		Kristall-Gleichricht.	GK/0302		
G140		Kristall-Gleichricht.	GK/0302		

		Änd.- zust.	Änd.-Mitgl. Nr.	Datum	Name	Liste Nr. 414202 Sa	Liste besteht aus Blatt Blatt Nr. 5	
1 CDE		Datum	Name					
geschrieben		19.9.67		Volk		Ersatz für Liste		
bearbeitet				Volk		Schalttailliste zu		
geprüft				BK		UHF-Empfänger-Meßsender 500...1800 MHz Type SMAI		
normgeprüft								

TK Aus- Renn- zeichen	Stück- zahl	Benennung	Sach-Nr.	Demerkungen
1	2	3	4	5
G143		Diode Sylvania D 5233	GJE 25620	
G145		Diode Sylvania D 5233	GJE 25620	
G147		Diode Sylvania D 5320	GJE 26680	
G148		Diode Sylvania D 5320	GJE 26680	
G149		Diode Sylvania D 5320	GJE 26680	
G150		Diode Sylvania D 5320	GJE 26680	
J 1		Drehapul-Strommesser	JOS 20100	Skala gez. nach 41420-3.3; hierzu 1 Blankokalenderbl. Z 4210
K 1		Kabel	LKK 92220	
K 2		Kabel	LKK 92220	
K 6		Kabel	LKK 91000	
K 7		Kabel	LKK 91000	

fall.-Pause Nr.

allspause Nr.

 ROHDE & SCHWARZ MÜNCHEN		And.- zusf.	And.-Mittlg. Nr.	Datum	Name	Liste Nr. 414202 Sa	Liste besteht aus Blatt Blatt Nr. 6
						Liste für Liste	
1 CDE	Datum	Name					
geschrieben	19.9.67	Volk					
bearbeitet		Volk					
geprüft		BC					
normgeprüft							

UHF-Empfänger-Meßsender 500...1800 MHz
Type SMAI

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Nachahmung, Entwertung, Fälschung, Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

7. X A. 1 P. 1 Z. 1	2. X A. 2 P. 2 Z. 2	3. X A. 3 P. 3 Z. 3	4. X A. 4 P. 4 Z. 4	5. X A. 5 P. 5 Z. 5	6. X A. 6 P. 6 Z. 6
1	2	3	4	5	6
K 8	Kabel	LKK 91000			
K 9	Kabel	LKK 91000			
K 11	Kabel, Kapazitätsarm (Gruppe)	356371 - 56/400			hierzu bes. Stückliste
K 13	Kabel	LKK 91000			
K 14	Kabel	LKK 91000			
K 15	Kabel	LKK 91000			
K 16	Leitung geschirmt	LFA 03022			überzog.m. LJS 4/0,5 gr (Schirm spannungsführend !)
K 17	Kabel	LKK 91000			überzog.m. LJS 4/0,5 gr (Schirm spannungsführend !)
K 18	Kabel	LKK 91000			überzog.m. LJS 4/0,5 gr (Schirm spannungsführend !)
K 19	HF-Kabel (Gruppe)	41420 - 38			hierzu bes. Stückliste
K 20	HF-Kabel	41420 - 1.88.3			
K 21	HF-Kabel	41420 - 1.50.12			
K 22	Kabel	LKK 92220			
K 23	Kabel	LKK 92220			
L 1	Reflektorspannungs- drossel (Gruppe)	41422 - 8.4			hierzu bes. Stückliste
L 2	Resonatorspannungs- drossel (Gruppe)	41420 - 8.4			hierzu bes. Stückliste
L 11	Induktivität				enth. in 414202 - 1
L 12	Induktivität				enth. in 414202 - 1

		Änd.- zust.	Änd.-Mitgl. Nr.	Datum	Name	Liiste Nr.	Liiste besteht aus Blatt
ROHDE & SCHWARZ MÜNCHEN						414202 Sa	Blatt Nr. 7
1 CDE	Datum	Name					
geschrieben	19.9.67	Volck	Entwurf für Liiste				
bearbeitet		Volck	Schaltplan				
geprüft		BE	UHF-Empfänger-Meßsender 500...1800 MHz Type SMAI				
normgeprüft							

 ROHDE & SCHWARZ MÜNCHEN	Änd.- zus.	Änd.-Mittlg. Nr.	Datum	Name	Liste Nr. 414202 Sa	Liste beaufh. aus Blatt
	a	-	25.10.67	Volk		Blatt Nr. 8
1. Stich Datum Name geschrieben 19.9.67 Volk bearbeitet Volk geprüft BK norm. geprüft					(Firma) für Liste XS 2000 / Schaltteilliste zu UHF-Empfänger-Meßsender 500...1800 MHz Type SMAI	

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

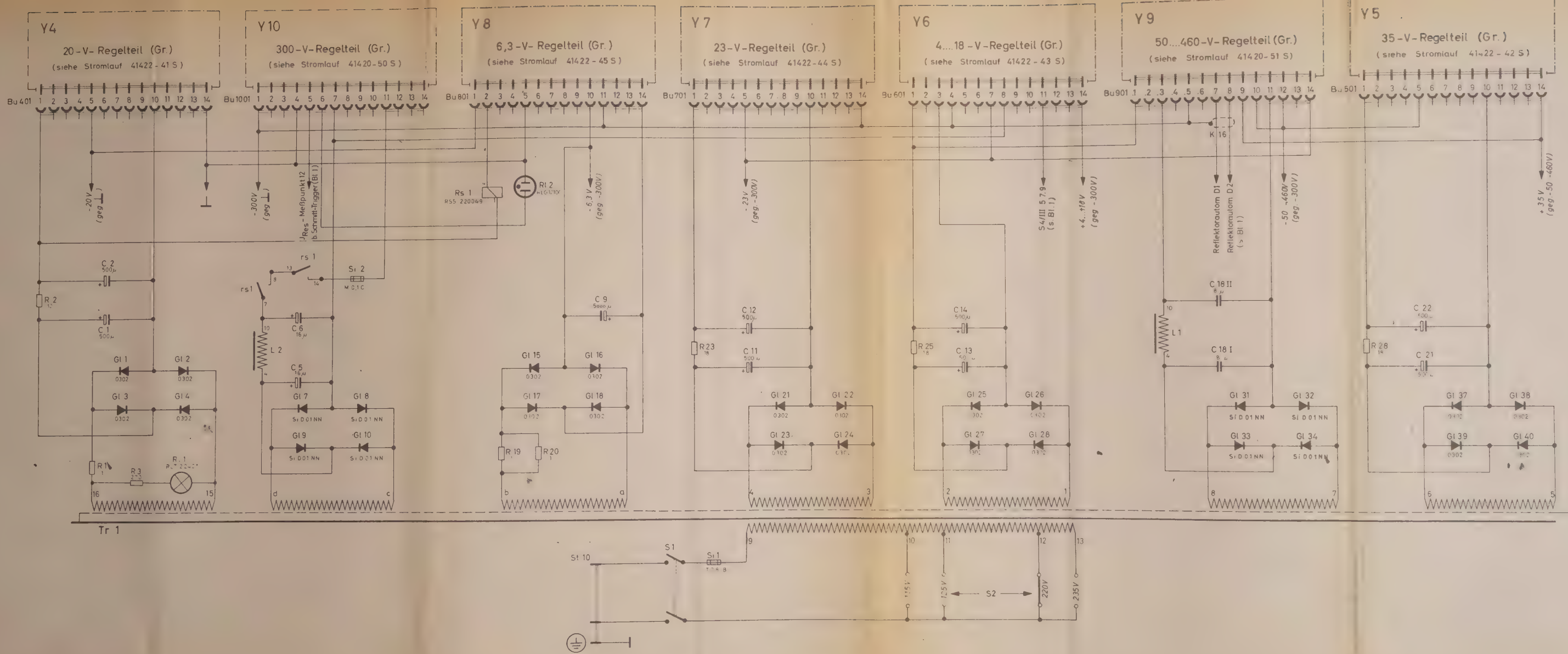
Stück zu zeichnen	Stück zahl	Benennung	Tech.-Nr.	5	6 Bemerkungen
1	2			5	6
St11		Schmelzeinsatz	T 0,8 B DIN 41571 T 1,6 D DIN 41571	b. 220/235 V b. 115/125 V	hierzu je 2 St.Res.
St12		Schmelzeinsatz	M 0,1 C DIN 41571		
St10		Gerätestecker	FES 21000		
Tr1		Netztrafo (Gruppe)	41420 - 10.3		hierzu bes. Stückliste

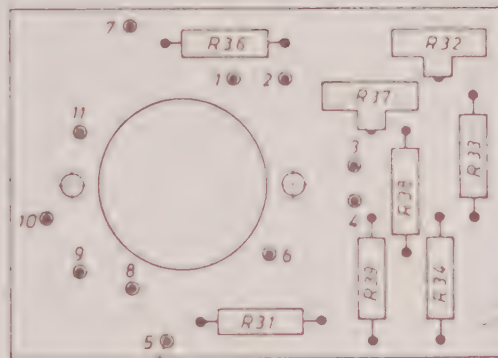
		Änd.- zus.	Änd.-Mittlg Nr.	Datum	Name	Liste Nr.	Liste besteht aus Blatt
ROHDE & SCHWARZ MÜNCHEN						414202 Sa	Blatt Nr. 11
1 CDE	Datum	Name	Ersatz für Liste				
geschrieben	19.9.67	Volk	UHF-Empfänger-Neosender 500...1800 MHz				
bearbeitet		Volk	Type SMAI				
geprüft		BE					
normgeprüft							



Handwritten notes and labels on the left margin, including 'Date', 'Name', 'Mz', 'Vok', '25.10.47', and 'BSC'.

ROHDE & SCHWARZ MÜNCHEN





ZH 15x2,5 Z (11 Stück)

R 32 und R 37 ohne Staubkappe

hierzu 41420-3.10.1 St

Projektion,
siehe I

Teilfall, Pause
Nr.

Teilspause Nr.

RS

ROHDE & SCHWARZ
MÜNCHEN

Halbzug, Werkstoff

Untolerierte Maße

Zeichn. Nr.

41420-3.10.1

Maßstab

1:1

Erstellt
von

ICDD	Datum	Name	Änd. zust.	Änd. Mittlg. Nr.	Datum	Name
gezeichnet	5.10.67	Wm	b	—	10.10.67	Ss
bearbeitet			c	14475	10.4.69	Fre
geprüft						
normgepr.						

Platte (Gr.)

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Weitergabe, Nachahmung oder andere Art der Verwertung, insbesondere durch Kopieren, Nachdruck, Verbreitung, Mithilfe, ist strafbar und schadenersatzpflichtig.

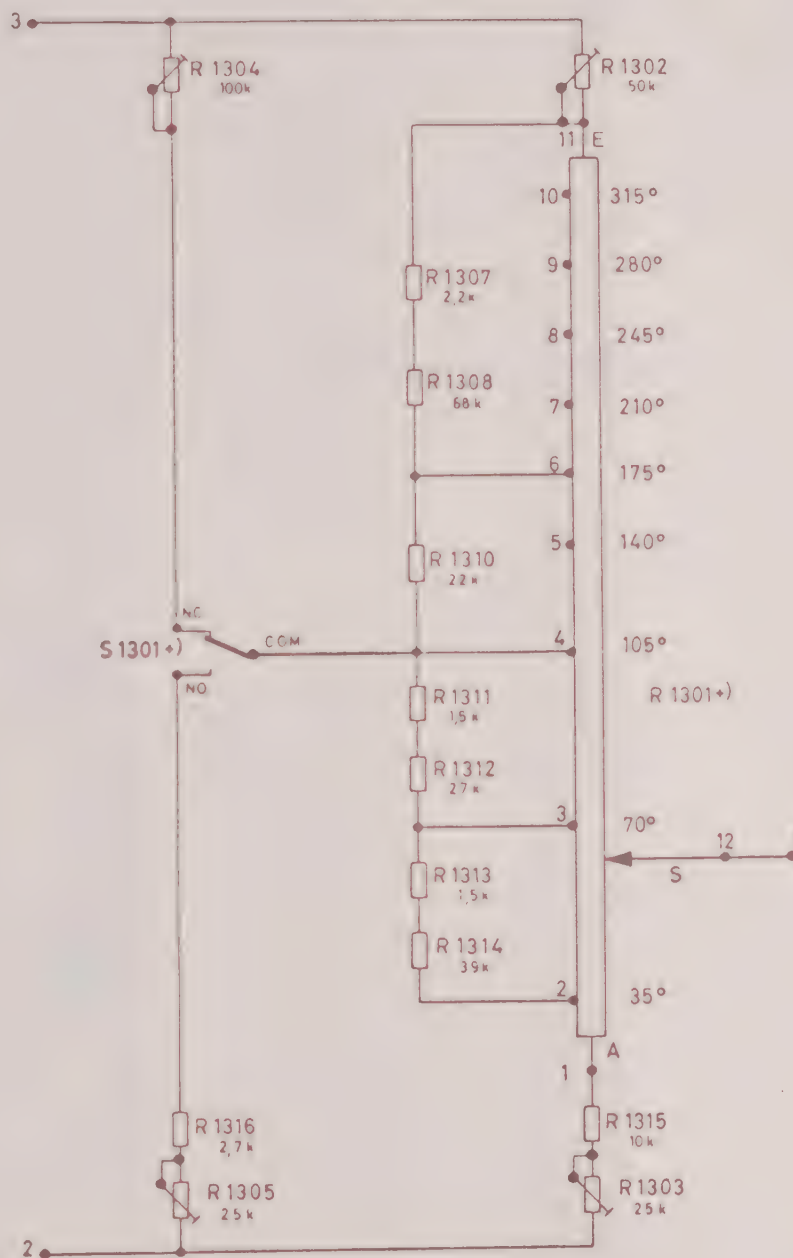
114 N. Kenn- zeichen	Stück- zahl	Benennung	Sech-Nr.		Bemerkungen
1	2	3	4	5	6
R1301		Präzisions- Draht-Drehwiderstand	41422 - 1.75..4		200 B
R1302		Schicht-Drehwiderst.	WSG 11010/25 k		
R1303		Schicht-Drehwiderst.	WSG 11010/25 k		
R1304		Schicht-Drehwiderst.	WSG 11010/100 k		
R1305		Schicht-Drehwiderst.	WSG 11010/25 k		
R1307		Schichtwiderstand	WFE 321 k 2,2		
R1308		Schichtwiderstand	WFE 321 k 68		
R1310		Schichtwiderstand	WFE 321 k 22		
R1311		Schichtwiderstand	WFE 321 k 1,5		
R1312		Schichtwiderstand	WFE 321 k 27		
R1313		Schichtwiderstand	WFE 321 k 1,5		
R1314		Schichtwiderstand	WFE 321 k 39		
R1315		Schichtwiderstand	WFE 321 k 10		
R1316		Schichtwiderstand	WFE 321 k 2,7		
S1308		Mikroschalter	SDH 35300		

1/t

1.000.000

 ROHDE & SCHWARZ MÜNCHEN		Änd.- zust.	Änd.-Mitgl. Nr.	Datum	Name	Liste Nr. 41420 - 1.75 Sa	Liste besteht aus 1 Blatt Blatt Nr.
1.000.000	Datum	Name				Ersatz für Liste	Stückliste / Schaltteilleiste zu Reflektorautomatik (Gruppe)
geschrieben	2.9.66	Volk					
bearbeitet		Volk					
geprüft		BC					
normgeprüft							

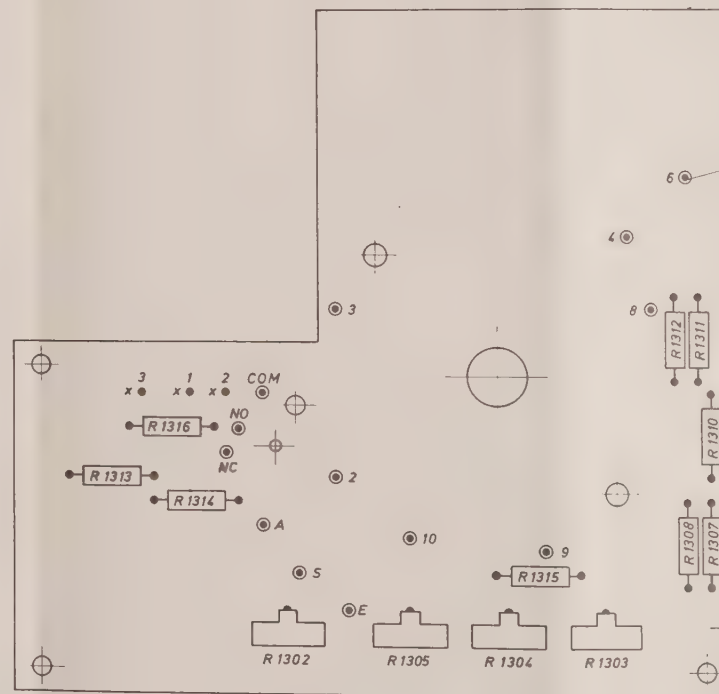
51



*) mechanisch gekuppelt; die Umschaltung auf NO erfolgt bei einem R1301-Drehwinkel von 105° (von 0° aus gerechnet).

hierzu Schaltteilliste 41420-1,75 Sa

 ROHDE & SCHWARZ MÜNCHEN			Halbzeug, Werkstoff		Untolerierte Maße		Zeichn. Nr. 41420-1.75 S	
					Maßstab		Ersatz f. Zeichn.	
1 CDE	Tag	Name	Ans. Ans. M. 11/77 Nr.	Tag	Name			
gezeichnet	6. 9. 66	Mz	a	22.11.66	Volk	Stromlauf zu		
bearbeitet		Volk				Reflektorautomatik (Gr.)		
geprüft		<i>BL</i>						
normgepr.								



ZH 1,5 x 4 Z (13 Stück)

- 1.75.2

* KL 93041-1 (3 Stück)

hierzu 41420-1.75.1st

 ROHDE & SCHWARZ MÜNCHEN		Holzzeug, Werkstoff		Unterteilte Maße		Zeichen-Nr.	
				Maßstab		41420-1.75.1	
1 CDD	Datum	Name	Änd. zust.	Änd. Hrtig Nr.	Datum	Name	Erstz. f. Zeichn.
gezeichnet	13.12.66	Ss					
bearbeitet							
geprüft							
versappt							
							Platte (Gr.)

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung oder andere Art der Ausbeutung ist ohne schriftliche Genehmigung der Rohde & Schwarz AG strafbar und schadenersatzpflichtig.

30-Projektion, Methode E
 Vervielfältig-Passat
 Arbeitspassat Nr.

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Weiterverbreitung, Nachdruck, Entwertung, Verwertung, Mithilfe, als andere ist strafbar und schadenersatzpflichtig.

Kennzeichen	Stückzahl	Benennung	Stück Nr.	Bemerkungen
1	2	3	4	5
Bu1101		Buchung	FML 51702/50	
C1101		Kf-Kondensator	CKG 62053 n 100	
C1102		Keramik-Kondensator	CCG 94/1000	
C1105		Kf-Kondensator	CKG 50053 n 220	
C1106		Elko	CED 22/100/15	
C1109		Keramik-Kondensator	CCH 68/100	
C1110		Kf-Kondensator	CKG 50053 n 470	
C1111		Kf-Kondensator	CKG 50053 n 470	
G11101		Si-Diode 1 N 914	GFE 26421	
G11102		Si-Diode 1 N 914	GFE 26421	
G11104		Z-Diode Z 8	GEE 26340 E 8,5	
G11105		Si-Diode 1 N 914	GFE 26421	

Blatt.-Pause Nr.

Blatt.-Pause Nr.

PS ROHDE & SCHWARZ MÜNCHEN		Änd.- zust.	Änd.- Nr.	Datum	Name	Liste Nr. 41420 - 1.90.20 Sa	Liste besteht aus 3 Blatt Blatt Nr. 1
		b	14237	11.12.68	Volk		
EKE	Datum	Name					Ersatz für Liste
geschrieben	10.6.68	Volk					Schmitt-Trigger (Gruppe)
bearbeitet		Volk					
geprüft		El					
normgeprüft							

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

Stück- zahl	Benennung	Sach-Nr.	Bemerkungen
1	2	4	6
L1101	Spule (Gruppe)	41422 - 1.90.23	hierzu bes. Stückliste
R1101	Schichtwiderstand	WFE 321 k 1,0	
R1102	Schichtwiderstand	WFE 321 k 2,7	
R1103	Schichtwiderstand	WFE 321 k 100	
R1104	Schichtwiderstand	WFE 321 k 100	
R1105	Schichtwiderstand	WFE 321 k 0,8	
R1107	Schichtwiderstand	WFE 321 k 470	
R1110	Schichtwiderstand	WFE 321 k 1,8	
R1111	Schichtwiderstand	WFE 321 k 8,2	
R1112	Schicht-Drehwiderst.	WSC 11000/1 k	
R1113	Schichtwiderstand	WFE 321 k 1,8	
R1115	Schichtwiderstand	WFE 321 k 1,8	
R1116	Schichtwiderstand	WFE 321 k 68	

RS ROHDE & SCHWARZ MÜNCHEN			Änd.- zus.	Änd.-Mitgl. Nr.	Datum	Name	Liste Nr.	Liste besteht aus Blatt
							41420 - 1.90.20 Sa	Blatt Nr. 2
EKE	Datum	Name						
geschrieben	16.6.66	Volk						
bearbeitet		Volk						
geprüft		Be						
normgeprüft								
							Ersatz für Liste	
							Schmitt-Trigger (Gruppe)	

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

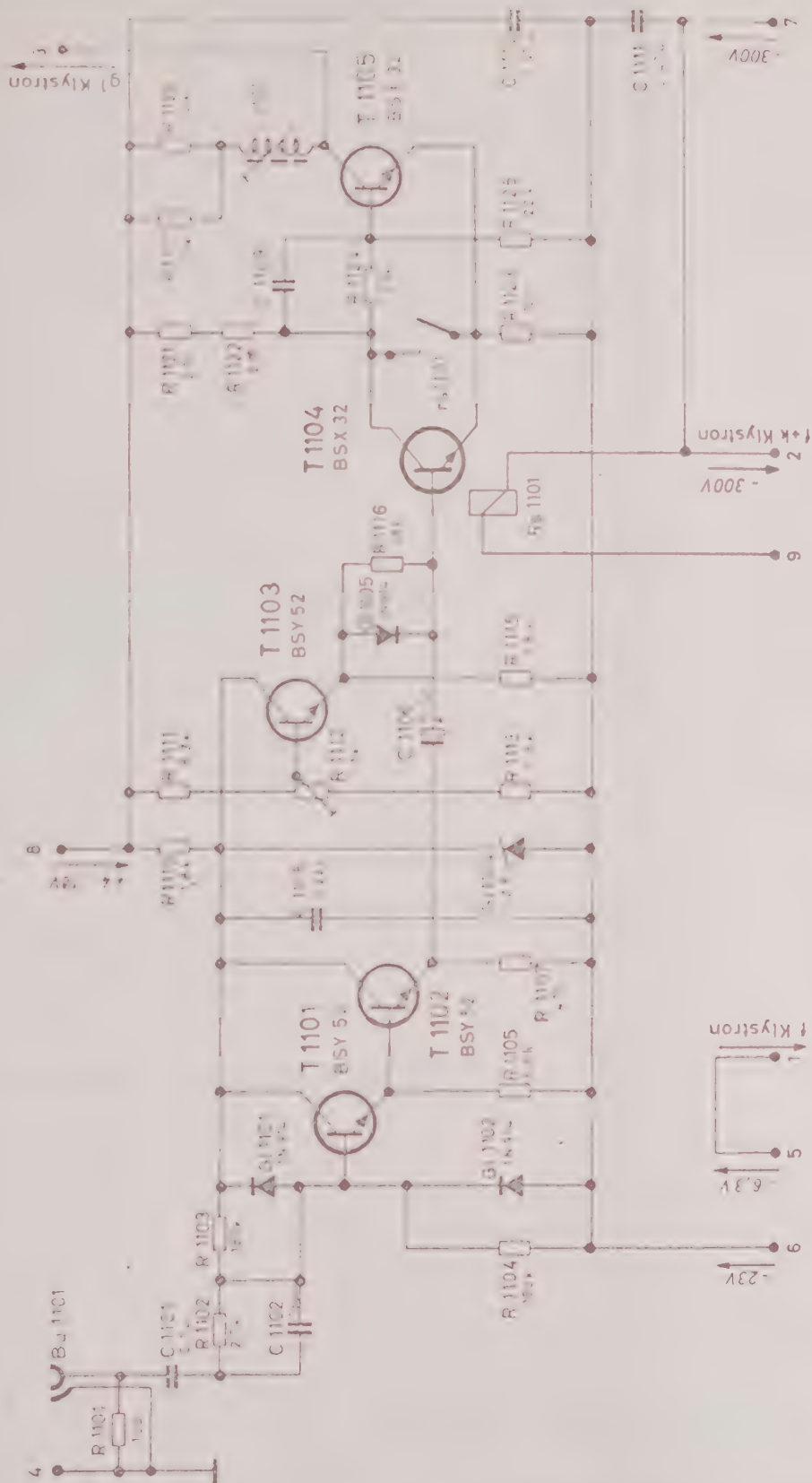
1 Kl.- Anm.- zeichen	2 Stück- zahl	3 Bezeichnung	4 Sach.-Nr.	5	6 Bemerkungen
R1121		Schichtwiderstand	WFE 521 E 270		
R1122		Schichtwiderstand	WFE 521 E 270		
R1123		Schichtwiderstand	WFE 321 E 120		
R1124		Schichtwiderstand	WFE 321 k 33		
R1125		Schichtwiderstand	WFE 321 k 22		
R1127		Schichtwiderstand	WFE 521 k 1,2		
R1128		Schichtwiderstand	WFE 521 k 1,2		
R1101		Relais (Gruppe)	41422 - 43.2		hierzu bes. Stückliste
T1101		Transistor BSY 52	GQF 25445		
T1102		Transistor BSY 52	GQF 25445		
T1103		Transistor BSY 52	GQF 25445		
T1104		Transistor BSX 32	GQF 26344		
T1105		Transistor BSX 32	GQF 26344		

el/Alt.-Pause Nr.

rbellapause Nr.

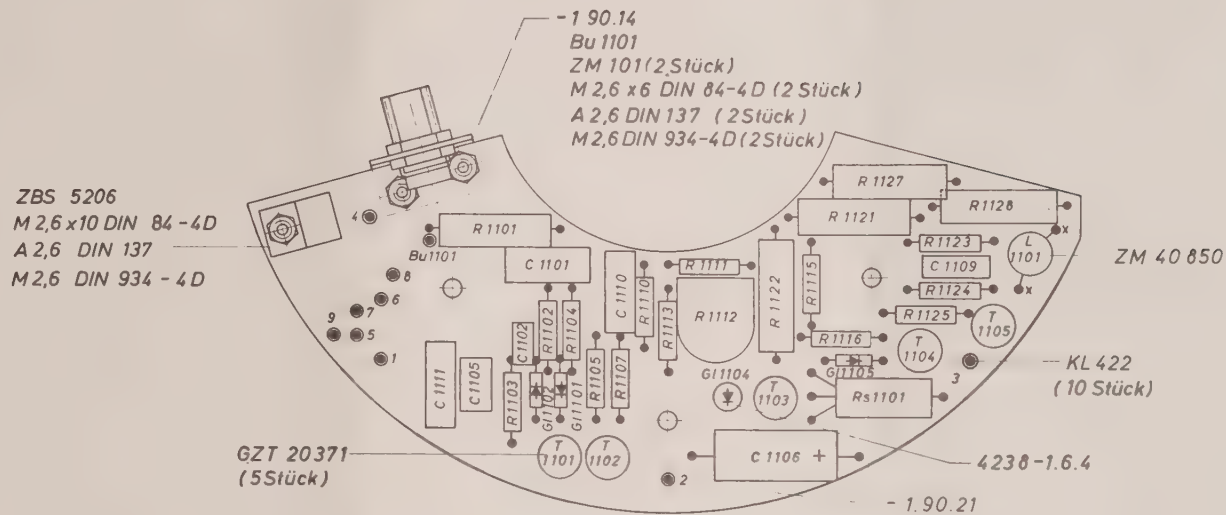
 ROHDE & SCHWARZ MÜNCHEN	Änd.- zust.	Änd.-Mitgl. Nr.	Datum	Name	Liste Nr.	Liste besteht aus Blatt
	a	-	14.9.67	Volk	41420 - 1.90.20 Sa	Blatt Nr. 3
b	14237	11.12.66	Volk			
gkx	Datum	Name			Ersatz für Liste	
geschrieben	16.6.66	Volke			Schmitt-Trigger (Gruppe)	
bearbeitet		Volke				
geprüft		Bl				
normgeprüft						

Diese Zeichnung ist unser Eigentum. Vermittlung, Vervielfältigung, Verbreitung, Vervielfältigung, Mitteilung an andere ist ohne schriftliche Genehmigung der Rohde & Schwarz AG strafbar.



hierzu Schalteilleiste, 41420-1.90.20 Sa

 ROHDE & SCHWARZ MÜNCHEN		Halbzeug, Werkstoff		Untolerierte Maße		Zeichn. Nr.	
				Meßstab		41420-1.90.20 S	
EKE	Tag	Name	And. zust.	And. Millig Nr.	Tag	Name	Erstellt f. Zeichn.
gezeichnet	29.12.65	Mz	a	—	14.9.67	Volk	
bearbeitet		Volk					
geprüft		Be					
abgegeben							
			Stromlauf zu				
			Schmitt-Trigger (Gr.)				



- 1.90.14, L 1161 und ZBS 1620/6 nach dem Tauchlöten montiert und gelötet nach HVM 230

x KLL 30804
(2 Stück)



hierzu 41420 - 1.90.20 S
41420 - 1.90.20 SI

 ROHDE & SCHWARZ MÜNCHEN				Halbzeug, Werkstoff		Untolerierte Maße		Zeichn. Nr.	
						Maßstab 1:1		41420 - 1.90.20	
1 CDD	Datum	Name	And. zuzf.	And. Mittlg. Nr.	Datum	Name	Ersatz f. Zeichn.		
gezeichnet	15.7.66	Wk	a	-	22.12.66	Fre			
bearbeitet			b	14.2.37	7.1.69	Gz			
geprüft									
normgepr.									

Schmitt - Trigger (Gr.)

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

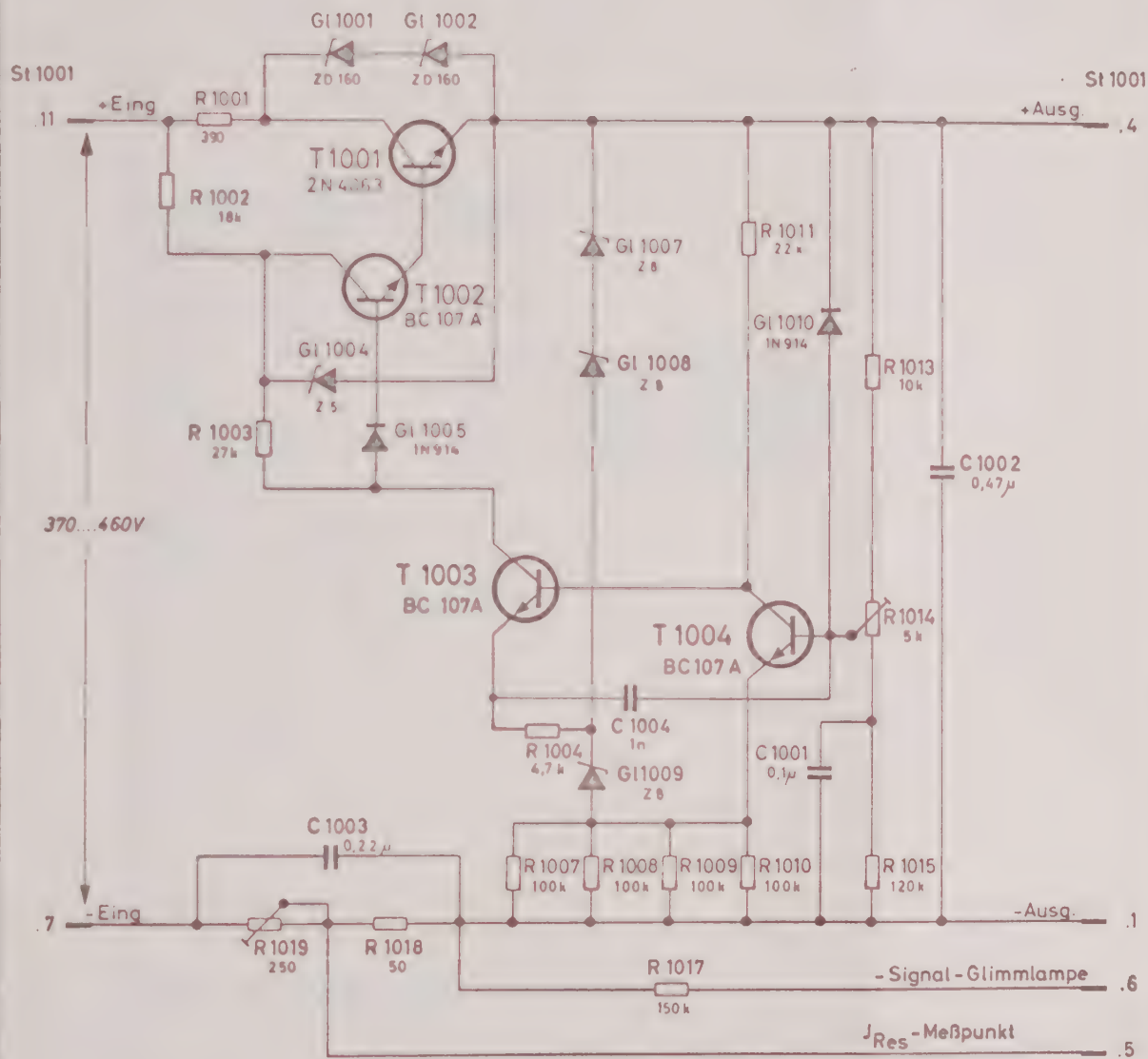
1	2	3	4	5	6
Stück- zahl	Benennung	Such-Nr.			Bemerkungen
C1001	MKT-Kondensator	CKG 62053 n 100			
C1002	MKT-Kondensator	CKG 62053 n 470			
C1003	MKT-Kondensator	CKG 50053 n 220			
C1004	Keramik-Kondensator	CCG 34/1000			
G11001	Z-Diode ZD 160	GEE 25540 E 160			
G11002	Z-Diode ZD 160	GEE 25540 E 160			
G11004	Z-Diode Z 5	GEE 26340 E 5,5			
G11005	Si-Diode 1 N 914	GFE 26421			
G11007	Z-Diode Z 8	GEE 26340 E 8,5			
G11008	Z-Diode Z 8	GEE 26340 E 8,5			
G11009	Z-Diode Z 8	GEE 26340 E 8,5			
G11010	Si-Diode 1 N 914	GFE 26421			
R1001	Schichtwiderstand	WFE 321 E 390			
R1002	Schichtwiderstand	WFE 521 k 18			
R1003	Schichtwiderstand	WFE 321 k 27			
R1004	Schichtwiderstand	WFE 321 k 4,7			
R1007	Schichtwiderstand	WFE 521 k 100			

Blattfall.-Pause Nr.

Blattpause Nr.

		Änd.- zust.	Änd.-Mittg. Nr.	Datum	Name	Liste Nr.	Liste besteht aus 2 Blatt	
ROHDE & SCHWARZ MÜNCHEN		1	14237	11.12.63	Volke	41420 - 50 Sa	Blatt Nr. 1	
1	Datum	Name						
geschrieben	11.12.63	Volke					Ersatz für Liste	
bearbeitet		Volke					Zusätzliche Schaltteilliste zu	
geprüft							300-V-Regelteil (Gruppe)	
normgeprüft								

Diese Zeichnung ist einer E-Zeichnung. Vervielfältigung, Verbreitung, Weiterleitung an andere ist unzulässig. Verfertigung, Herstellung und Nachbearbeitung ist unzulässig.



hierzu Schaltteilliste 41420-50 Sa

ROHDE & SCHWARZ MÜNCHEN		Halbzeug, Werkstoff		Untolerierte Maße		Zeichn. Nr. 41420-50 S	
EKE		Tag		Name		Maßstab	
gezeichnet	6.6.66	Mz	a	6.7.66	Volk	Stromlauf zu 300-V-Regelteil (Gr.)	
bearbeitet		Volk	b	22.11.66	Volk		
geprüft		BE	c	14.9.67	Volk		
normgepr.			d	14.237	9.12.68		



0-Projektion, Methode E

vielfält.-Pause Nr.

bettpause Nr.

 ROHDE & SCHWARZ MÜNCHEN		Halbzeug, Werkstoff		Unfertierte Maße		Zeichn. Nr.	
				Maßstab		41420 - 50	
1CDD	Datum	Name	Änd. zust.	Änd. Mittlg. Nr.	Datum	Name	Ersatz f. Zeichn.
gezeichnet	15.7.66	Schp	a	—	1.9.66	Fre	
bearbeitet			b	—	6.10.67	Wk	
geprüft							
normgepr.							

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Weiterverbreitung, Mitteilung an andere ist strafbar und Schadensersatzpflichtig.

1/2. Pos. Kennzeichen	Stückzahl	Benennung	Sach-Nr.		Bemerkungen
1	2	3	4	5	6
C901		MKT-Kondensator	CKG 62053 n 470		
C903		Keramik-Kondensator	CGG 91/220		
C904		Elko	CED 21/250/35		
C906		MKT-Kondensator	CKG 62053 n 100		
C907		MKT-Kondensator	CKG 50053 n 470		
C909		MKT-Kondensator	CKG 62053 n 470		
G1901		Z-Diode ZD 160	GEE 25540 E 160		
G1902		Z-Diode ZD 160	GEE 25540 E 160		
G1903		Z-Diode ZD 160	GEE 25540 E 160		
G1904		Z-Diode ZD 160	GEE 25540 E 160		
G1906		Z-Diode ZD 160	GEE 25540 E 160		
G1908		Z-Diode Z 10	GEE 26340 E 10		
G1909		Z-Diode Z 5	GEE 26340 E 5,5		
G1911		Z-Diode BZY 25	GEE 23241 E 8,4		
G1912		Z-Diode BZY 25	GEE 23241 E 8,4		

Vervielfält.-Pause Nr.

Arbeitspause Nr.

 ROHDE & SCHWARZ MÜNCHEN		Änd.-zust.	Änd.-Mitgl. Nr.	Datum	Name	Liste Nr. 41420 - 51 Sa	Liste besteht aus 4 Blatt Blatt Nr. 1
		b	14237	9.12.68	Volk		
1	Datum	Name					
gezeichnet	9.12.68	Volk					Erstellt für Liste
bearbeitet		Volk					Stückliste Schaltteilliste zu 50...460-V-Regelteil (Gruppe)
geprüft							
normgeprüft							

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Vervielfältigung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

1 Stück- zahl	2 Benennung	3 Sach-Nr.	4 Bemerkungen
1	2	3	4
G1914	Si-Gl. Si D02 N	GKE 25841	
R901	Schichtwiderstand	WFE 321 k 1	
R902	Schichtwiderstand	WFE 321 k 330	
R903	Schichtwiderstand	WFE 521 k 68	
R905	Schichtwiderstand	WFE 521 k 100	
R906	Schichtwiderstand	WFE 321 k 120	
R907	Schichtwiderstand	WFE 321 k 22	
R908	Schicht-Drehwiderst.	WGG 11010/25 k	
R910	Schichtwiderstand	WFE 321 k 1,5	
R911	Schichtwiderstand	WFE 321 k 10	
R912	Schichtwiderstand	WFE 321 E 82	
R913	Schichtwiderstand	WFE 321 k 10	
R914	Schichtwiderstand	WFE 321 k 47	
R916	Schichtwiderstand	WFE 321 k 2,7	
R917	Schichtwiderstand	WFE 321 k 4,7	
R918	Schichtwiderstand	WFE 321 k 1	

vielfält.-Pause Nr.

Arbeitspause Nr.

 ROHDE & SCHWARZ MÜNCHEN		Änd.- zust.	Änd.-Mittlg Nr.	Datum	Name	Liste Nr.	Liste besteht aus Blatt
				11.12.5		41420 - 51 54	
				11.12.5			Blatt Nr. 2
1	Datum	Name					
geschrieben	1.3.01						Ersatz für Liste
bearbeitet							Stückliste/Schalttailliste zu
geprüft		BC					50...460-V-Regelteil (Gruppe)
normgeprüft							

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Weiterverbreitung, Nachahmung oder sonstiger Gebrauch ohne schriftliche Genehmigung ist strafbar und schadenersatzpflichtig.

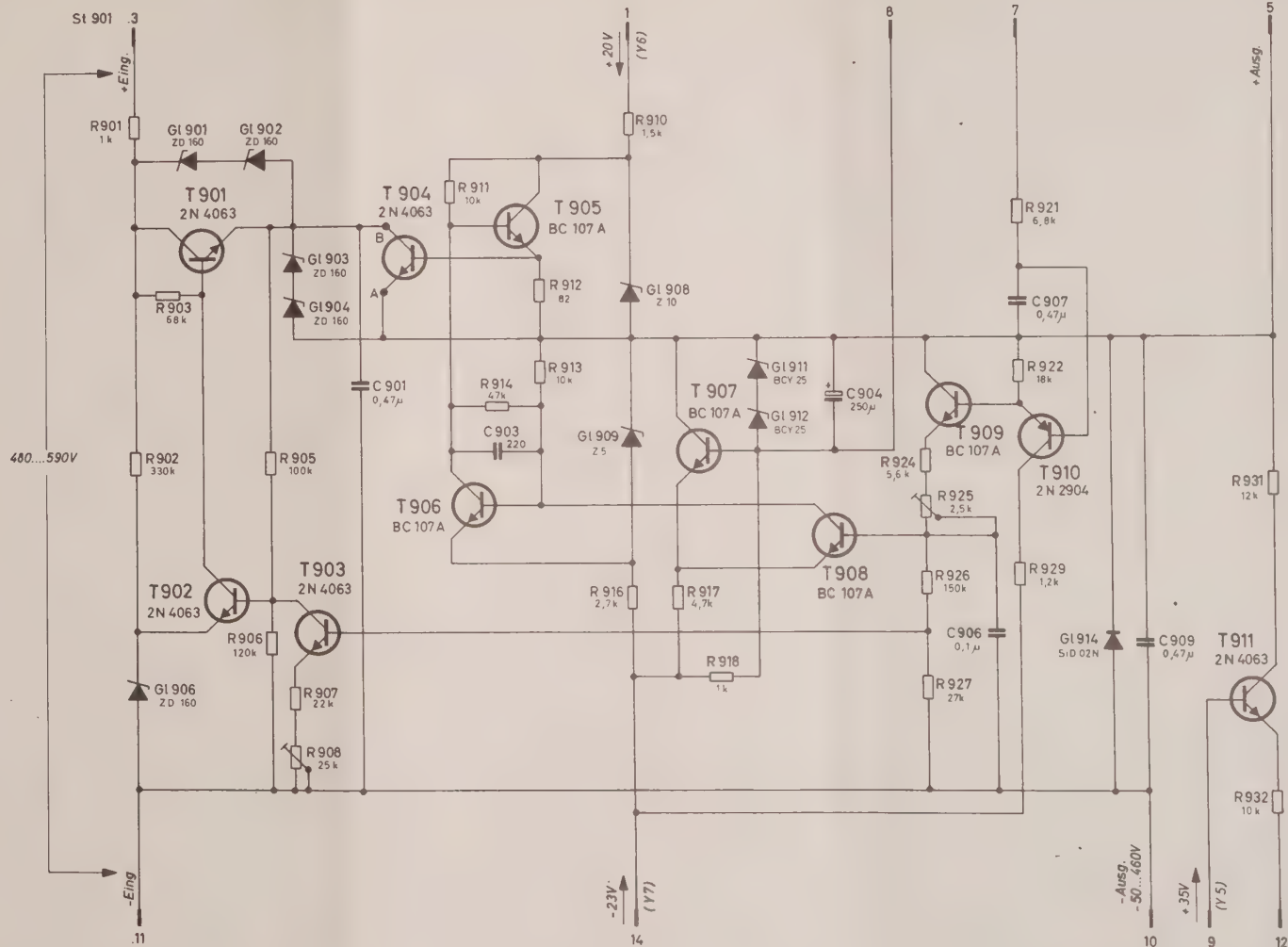
1	2	3	4	5	6
Stück- zahl	Bezeichnung	Sach-Nr.			Bemerkungen
R928	Schichtwiderstand	WFB 321 k 10			
St901	Steckerleiste	FUL 51410			
T901	Transistor	GT/40255			
T902	Transistor	GT/40255			
T903	Transistor	GT/40255			
T904	Transistor	GT/40255			
T905	Transistor	GT/BC 107			
T906	Transistor	GT/BC 107			
T907	Transistor	GT/BC 107			
T908	Transistor	GT/BC 107			
T909	Transistor	GT/BC 107			
T910	Transistor	GT/MM 1614			
T911	Transistor	GT/40255			

elfalt.-Pause Nr.

ellepause Nr.

		Änd.- zust.	Änd.-Mittig Nr.	Datum	Name	Liste Nr.	Liste besteht aus	Blatt
ROHDE & SCHWARZ MÜNCHEN						41420 - 51 Sa		
1	CHN	Datum	Name				Blatt Nr.	3
geschrieben	1.9.66	Volk				Ersatz für Liste		
bearbeitet		Volk				STABKULTUR / Schaltteilliste zu		
geprüft						50...460-V-Regelteil (Gruppe)		
normgeprüft								

(R 1301 in Y 13)



hierzu Schaltteilliste 41420-51 Sa

Stromlauf zu

50...460- V- Regelteil (Gr.)

Zeichn. Nr.

41420-51 S

ROHDE & SCHWARZ · MÜNCHEN

Diese Zuteilung ist unser Eigentum. Vervielfältigung, unbefugte Vervielfältigung, Mitteilung an andere ist strafbar und untersagungsgegenständlich.

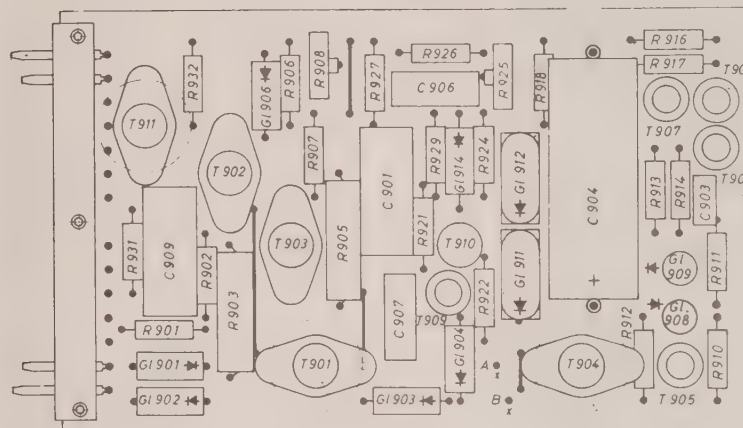
CODE	Domain	Volume	Just.	Nr.	Domain	Volume
gazettabol	18.4.67	MZ	a	—	17.4.67	Volk
Aschertel		Volk	b	14237	9.12.68	Volk
garrett	25.10.67	BE				

LD 208

KL 422(2Stück)

FUL 51410
(SI 901)

ZH15 x 7
(3Stück)



GZT 20371(6 Stück)

41422-46.2 (2Stück)

- 51.1

GZT 20283 (2Stück)

GZT 20370(5Stück)
für T901,T902,T903,
T904 und T911

GZT 12378(3 Stück)
für T901,T904 und T911

x KLL 10600(2Stück)

hierzu 41420 - 51 S
41420 - 51 SI

 ROHDE & SCHWARZ MÜNCHEN	Halbzeug, Werkstoff				Untolerierte Maße		Zeichn. Nr. 41420 - 51
					Maßstab 1:1		
1CDD	Datum	Name	And. Nr.	And. Mithg. Nr.	Datum	Name	1:200 Zeichn.
gezeichnet	22.3.67	Wh.	a		21.11.67	Fz.	
gep. bereit							
gep. u/f							
50.. 460 V- Regelteil (Gr)							

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Vervielfältigung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

1 Z. A. Kenn- zeichen	2 Zahl	3 Benennung	4 Sach-Nr.	5	6 Bemerkungen
R101		Schichtwiderstand	WFE 321 k 22		
R102		Schicht-Drehwiderst.	WSG 10010 k 100		
R103		Schicht-Drehwiderst.	WSG 10010 k 100		
R104		Schichtwiderstand	WFE 321 k 27		
R105		Schichtwiderstand	WFE 321 k 150		
R106		Schichtwiderstand	WFE 321 k 1,8		
R109		Schichtwiderstand	WFE 321 M 2,7		
R110		Schichtwiderstand	WFE 321 M 2,7		
R111		Schichtwiderstand	WFE 321 k 47		
R112		Schichtwiderstand	WFE 321 k 66		
R113		Schichtwiderstand	WFE 321 k 27		
R116		Schichtwiderstand	WFE 321 k 180		
R117		Schicht-Drehwiderst.	WSG 11010/250 k		
R118		Schichtwiderstand	WFE 321 k 47		
R119		Schichtwiderstand	WFE 321 k 720		
R120		Schichtwiderstand	WFE 321 k 220		
R121		Schichtwiderstand	WFE 321 k 33		
R124		Schichtwiderstand	WFE 321 E 680		
R125		Schichtwiderstand	WFE 321 k 12		
R126		Schicht-Drehwiderst.	WSG 11010/250 k		
R127		Schichtwiderstand	WFE 321 k 10		

Vervielfält.-Pause Nr.

Arbeitspause Nr.

 ROHDE & SCHWARZ MÜNCHEN		Änd. - zust.	Änd. - Mittlg. Nr.	Datum	Name	Liste Nr. 41420 - 52 Sa	Liste besteht aus Blatt
		a	-	5.9.67	Volk		Blatt Nr. 2
		b	14257	11.12.67	Volk		
1. Chn.	Datum	Name					
geschrieben	5.9.67	Volk					Ersatz für Liste CHOPPER/ Schaltteilliste zu Chopper-Verstärker (Gruppe)
bearbeitet		Volk					
geprüft		BC					
normgeprüft							

Diese Zeichnung ist unser Eigentum. Verstoß gegen die
unbefugte Vervielfältigung, Mitteilung an Dritte ist
strafbar und Schadensersatzpflichtig.

1	2	3	4	5	6
R126	Schichtwiderstand	WFE 321 E 150			
R131	Schichtwiderstand	WFE 321 k 10			
R132	Schichtwiderstand	WFE 321 k 4,7			
R133	Schichtwiderstand	WFE 321 E 330			
R134	Schichtwiderstand	WFE 321 k 33			
R136	Schichtwiderstand	WFE 321 k 27			
R137	Schichtwiderstand	WFE 321 k 6,8			
R138	Schichtwiderstand	WFE 321 k 6,8			
R139	Schichtwiderstand	WFE 321 E 680			
R141	Schichtwiderstand	WFE 321 M 5,6			
R142	Schichtwiderstand	WFE 321 k 18			
St101	Steckerleiste	FUL 51410			

Vervielfält.-Pause Nr.

Arbeitspause Nr.

 ROHDE & SCHWARZ MÜNCHEN		Änd.- zus.	Änd.-Mittlg. Nr.	Datum	Name	Liste Nr. 41420 - 52 Sa	Liste besteht aus Blatt
		a	-	5.9.67	Volk		Blatt Nr. 3
1 CDE	Datum	Name				Eracht für Liste	
geschrieben	5.9.67	Volk				CS 3001/66 / Schaltteilliste zu	
bearbeitet		Volk				Chopper-Verstärker (Gruppe)	
geprüft		EC					
normgeprüft							

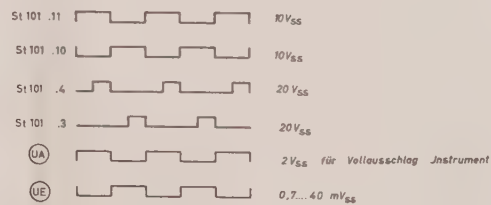


Vervielfält.-Pause Nr.

Arbeitspause Nr.

 ROHDE & SCHWARZ MÜNCHEN	Änd.- zuel.	Änd.-Mittlg. Nr.	Datum	Name	Liste Nr. 41420 - 52 Sa Ersatz für Liste ~~Stichtag~~ Schalttafeliste zu Chopper-Verstärker (Gruppe)	Liste besteht aus Blatt Blatt Nr. 4
	b	14237	3.12.68	Volk		
1. CDS	Datum	Name				
geschrieben	3.12.68	Volk				
bearbeitet		Volk				
geprüft						
normgeprüft						

ICDE	Tag	Name	Ans. nat.	Ans. Mith. Nr.	Tag	Nr.
gesellschaft	7 9 67	Mz	a	—	7 9 67	Volk
beihilfe		Volk	b	—	23 10 67	Volk
gesundheit	30.10.67	St				
berufsg.						



Stromlauf zu		hierzu Schaltteilliste 41420-52 Sa
	Chopper-Verstärker (Gr.)	Zeichn. Nr.
		41420-52 S



hierzu 41420-52 S
41420-52 St

 ROHDE & SCHWARZ MÜNCHEN	Halbzeug, Werkstoff		Unterteilte Maße		Zeichn. Nr. 41420-52	
			Maßstab 1:1			
1CDD Datum Name gezeichnet 13.10.67 Wm bearbeitet geprüft normgepr.	Amt Amt. Nr. a 14 237	Datum Name 7. 1. 69 Gz	Chopper-Verstärker (Gr)			

Chopper-Verstärker (Gr.)

7.3 Zusatz Material		7.4 Bezeichnung	7.5 Zusatz Material	7.6 Bezeichnung	7.7 Zusatz Material	7.8 Bezeichnung
1	2	3	4	5	6	7
C201		Tantal-Elko	CEU 36343 u 10			
C202		KS-Kondensator	CKS 44155 n 22			
C203		Tantal-Elko	CEU 36343 u 10			
C204		KS-Kondensator	CKD 52047 n 3,3			
C207		Keramik-Kondensator	CCH 68/100			
C208		KS-Kondensator	CKD 52115 p 200			
C209		KS-Kondensator	CKD 52115 p 200			
C210		Keramik-Kondensator	CCH 68/56			
C211		Keramik-Kondensator	CCH 68/56			
C214		Elko	CEU 22/100/15			
C215		Tantal-Elko	CEU 36343 u 10			
G1201		Si-Diode 1 N 914	GFE 26421			
G1202		Si-Diode 1 N 914	GFE 26421			
G1203		Si-Diode 1 N 914	GFE 26421			
G1204		Si-Diode 1 N 914	GFE 26421			
G1205		Si-Diode 1 N 914	GFE 26421			
G1207		Si-Diode 1 N 914	GFE 26421			

Arbeitspause Nr.

Stück- zahl	Benennung	Sach-Nr.	Bemerkungen
1	Si-Diode 1	GFE 26421	
1	Si-Diode 1	GFE 26421	
1	Oszillatorspule (Gr.)	41420 - 53.10	hierzu bes. Stückliste
1	Schichtwiderstand	WFE 321 k 18	
1	Schichtwiderstand	WFE 321 k 1,8	
1	Schichtwiderstand	WFE 321 k 4,7	
1	Schichtwiderstand	WFE 321 k 1	
1	Schichtwiderstand	WFE 321 k 2,7	
1	Schichtwiderstand	WFE 321 k 47	
1	Schichtwiderstand	WFE 321 k 12	
1	Schichtwiderstand	WFE 321 k 120	
1	Schichtwiderstand	WFE 321 k 10	
1	Schichtwiderstand	WFE 321 k 12	
1	Schichtwiderstand	WFE 321 k 180	

ROHDE & SCHWARZ
MÜNCHEN

1 CD. Datum Name

geschrieben 6.9.67 Volk

bearbeitet Volk

geprüft 86

normgeprüft

And. - Zus. And. - Mittlg. Nr. Datum Name

a - 6.9.67 Volk

b 14237 11.12.63 VL

Liste Nr. 41420 - 53 Sa

Liste besteht aus Blatt 2

Ersatz für Liste

1-kHz-Generator (Gruppe)

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

Wt

1	2	3	4	5	6
1	2	3	4	5	6
R215		Schichtwiderstand	WFE 321 k 120		
R217		Schichtwiderstand	WFE 321 k 1,8		
R218		Schichtwiderstand	WFE 321 k 1,8		
R219		Schichtwiderstand	WFE 321 k 470		
R220		Schichtwiderstand	WFE 321 k 220		
R222		Schichtwiderstand	WFE 321 k 1,2		
R223		Schichtwiderstand	WFE 321 E 680		
R224		Schichtwiderstand	WFE 321 k 1,8		
R225		Schichtwiderstand	WFE 321 k 220		
R226		Schichtwiderstand	WFE 321 k 39		
R227		Schichtwiderstand	WFE 321 k 470		
R229		Schichtwiderstand	WFE 321 k 39		
R230		Schichtwiderstand	WFE 321 E 470		
R231		Schichtwiderstand	WFE 321 k 120		
R232		Schichtwiderstand	WFE 321 k 27		
R233		Schichtwiderstand	WFE 321 k 5,6		
R235		Schichtwiderstand	WFE 321 k 10		
R236		Schichtwiderstand	WFE 321 k 10		
R237		Schichtwiderstand	WFE 321 k 120		
R238		Schichtwiderstand	WFE 321 k 5,6		
R239		Schichtwiderstand	WFE 321 k 27		

Vervielfält.-Pause Nr.

Arbeitspause Nr.

		Änd.-zust.	Änd.-Mittel Nr.	Datum	Name	Liste Nr.	Liste besteht aus	Blatt
ROHDE & SCHWARZ MÜNCHEN		a	-	6.9.67	Volke	41420 - 53 Sa		Blatt Nr. 3
		b	14237	11.12.68	Volke			
1 CDE	Datum	Name				Erstellt für Liste		
geschrieben	6.9.67	Volke				Sicherheits-Schaltteilliste zu		
bearbeitet		Volke				1-kHz-Generator (Gruppe)		
geprüft		BE						
normgeprüft								

Tag

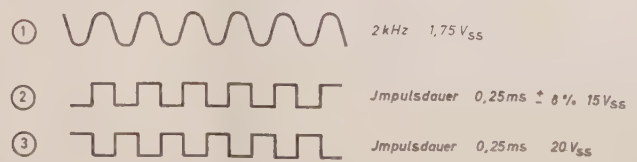
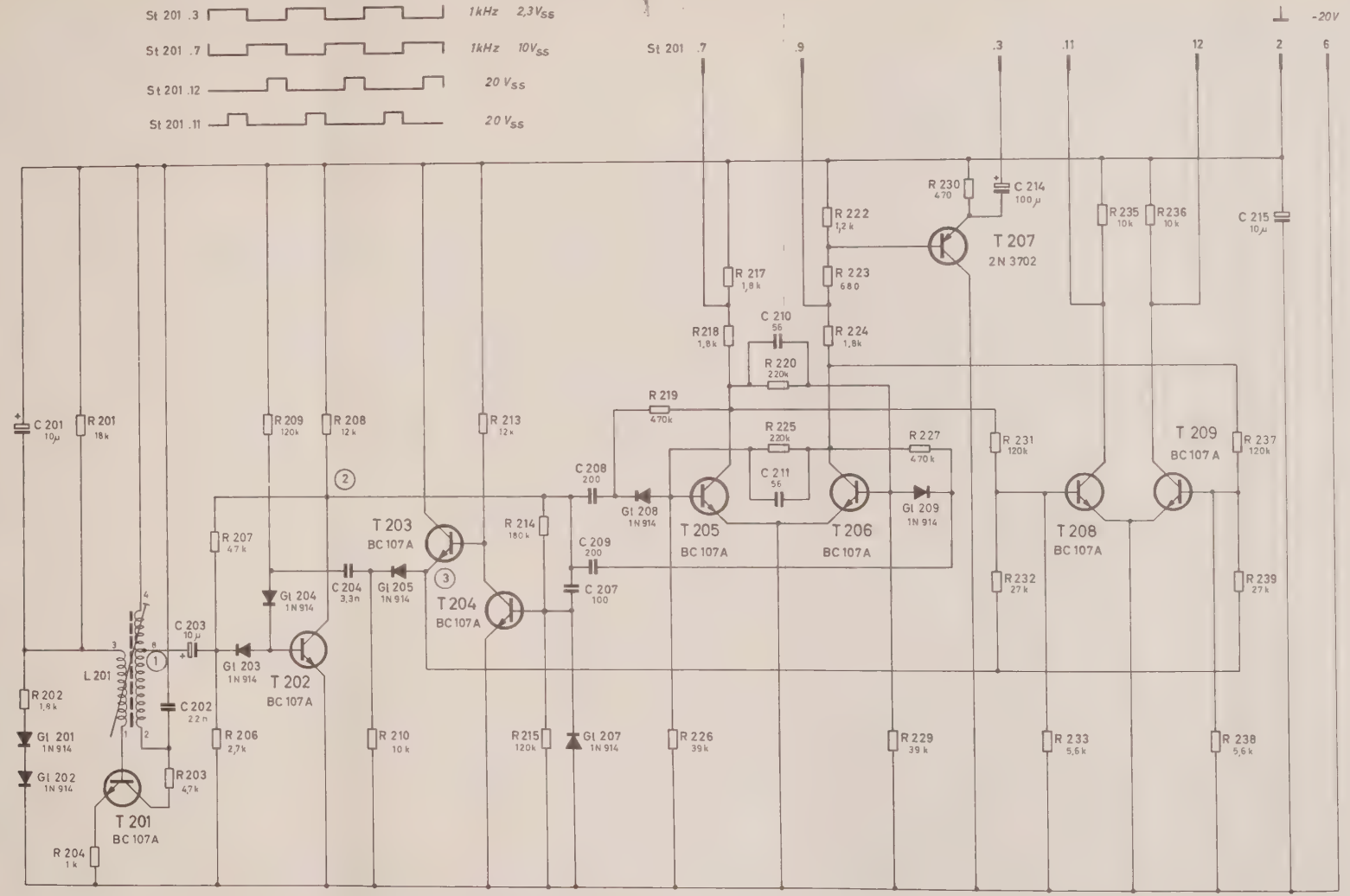
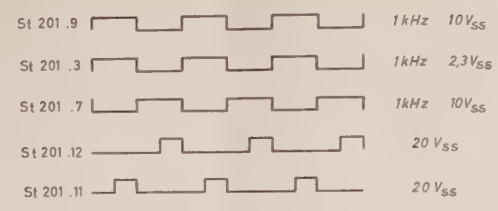
Name	Datum	And. Nr.	And. Nr.	Name	Datum	And. Nr.	And. Nr.

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Weiterverbreitung oder andere Art der Verwertung ist ohne schriftliche Genehmigung der Rohde & Schwarz AG strafbar und schadenstreuerpflichtig.

ROHDE & SCHWARZ · MÜNCHEN

Name	Datum	And. Nr.	And. Nr.	Name	Datum	And. Nr.	And. Nr.

1 2 3 4 5 6 7 8

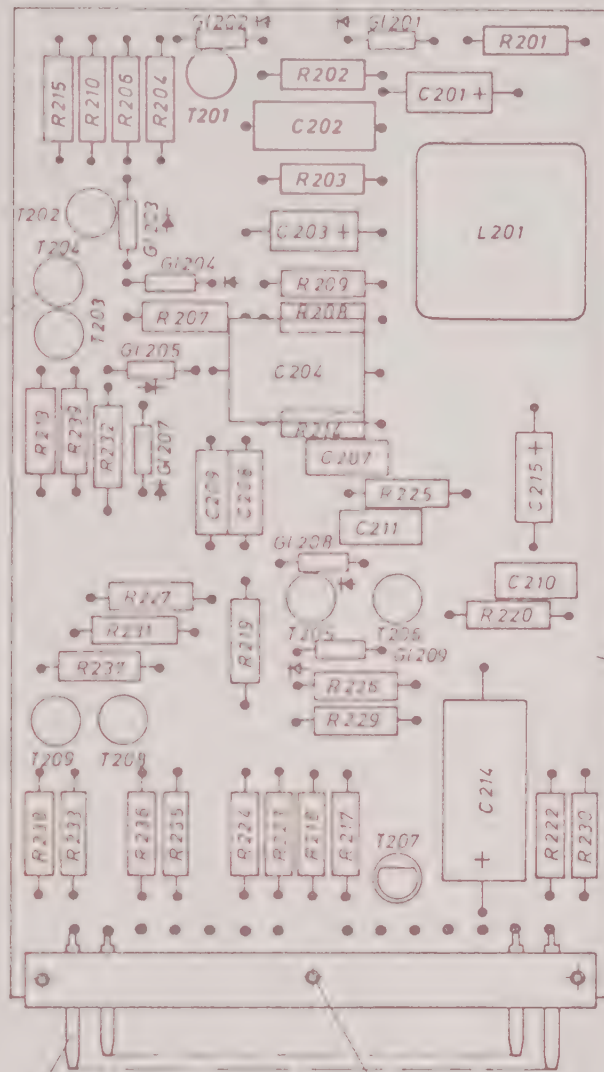


hierzu Schaltteilliste 41420-53 Sa

Stromlauf zu
1-kHz-Generator (Gr.)

Zeichn. Nr.
41420-53 S

GZT 20283
(9 Stück)



FUL 51410 (St 201)

ZH 1,5x7
(3 Stück)

T207 Kollektor abgewinkelt



hierzu 41420-53 S
41420-53 St

30 Projektion,
Methode E

Vervielfält. Pause
Nr.

Arbeitspause Nr.

ROHDE & SCHWARZ
MÜNCHEN

Halbzeug, Werkstoff

Untolerierte Maße

Zeichn. Nr.

41420-53

Maßstab

1:1

Exemplar
Zeichn.

1CDD Datum Name Änd. Zust. Änd. Mittlg. Nr. Datum Name

gezeichnet 13.10.67 Wm

bearbeitet

geprüft

normgepr.

1-kHz-Generator (Gr.)

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Vervielfachung, Mitteilung an andere ist strafbar und schadenstiftend.

1	2	3	4	5	6
Stück- zahl	Benennung	Sach-Nr.			Bemerkungen
C1201	HF-Kondensator	CMR 0,5/1600/4			
C1202	Keramik-Kondensator	CCG 94/1000			
C1205	Elko	CED 22/100/15			
C1208	Kf-Kondensator	CKG 46053 n 470			
C1209	Kf-Kondensator	CKD 2/500/125			
C1210	Keramik-Kondensator	CCG 68/10			
C1211	Keramik-Kondensator	CCM 68/56			
C1212	Keramik-Kondensator	CCG 68/12			
C1213	Elko	CED 21/25/35			
G11201	Kristall-Diode	GK/1 N 914			
G11202	Kristall-Diode	GK/1 N 914			
G11203	Kristall-Gleichricht.	GK/0302			
R1201	Schichtwiderstand	WFE 321 K 10			
R1202	Schichtwiderstand	WFE 321 M 2,2			
R1203	Schichtwiderstand	WFE 321 M 2,7			
R1204	Schichtwiderstand	WFE 321 K 27			

Arbeitspausen-Nr.

 ROHDE & SCHWARZ MÜNCHEN		Änd.- zusl.	Änd.-Mitgl. Nr.	Datum	Name	Liste Nr. 41422 - 1.76 Sa	Liste besteht aus 4 Blatt
		a	-	29.4.66	Volke		
		c	12790	3.3.67	Volke		
EKE	Datum	Name					
geschrieben	29.4.66	Volke					
bearbeitet		Volke					
geprüft		BC					
normgeprüft							
Ersatz für Liste \						5284210001 Schaltteilliste zu	
FM-Verstärker (Gruppe)							

Arbeitspausen-Nr.

Arbeitspausen Nr.

1 Lfd. Nr. Kenn- zeichen	2 Stück- zahl	3 Benennung	4 Stück-Nr.	5	6 Bemerkungen
1113			41422 - 1.76 Sa		
1114			41422 - 1.76 Sa		
1121			41422 - 1.76 Sa		
1122			41422 - 1.76 Sa		
1123			41422 - 1.76 Sa		
1124			41422 - 1.76 Sa		
1125			41422 - 1.76 Sa		
1126			41422 - 1.76 Sa		
1127			41422 - 1.76 Sa		
1128			41422 - 1.76 Sa		
1129			41422 - 1.76 Sa		
1130			41422 - 1.76 Sa		
1131			41422 - 1.76 Sa		
1132			41422 - 1.76 Sa		
1133			41422 - 1.76 Sa		
1134			41422 - 1.76 Sa		
1135			41422 - 1.76 Sa		
1136			41422 - 1.76 Sa		
1137			41422 - 1.76 Sa		
1138			41422 - 1.76 Sa		
1139			41422 - 1.76 Sa		
1140			41422 - 1.76 Sa		
1141			41422 - 1.76 Sa		
1142			41422 - 1.76 Sa		
1143			41422 - 1.76 Sa		
1144			41422 - 1.76 Sa		
1145			41422 - 1.76 Sa		
1146			41422 - 1.76 Sa		
1147			41422 - 1.76 Sa		
1148			41422 - 1.76 Sa		
1149			41422 - 1.76 Sa		
1150			41422 - 1.76 Sa		
1151			41422 - 1.76 Sa		
1152			41422 - 1.76 Sa		
1153			41422 - 1.76 Sa		
1154			41422 - 1.76 Sa		
1155			41422 - 1.76 Sa		
1156			41422 - 1.76 Sa		
1157			41422 - 1.76 Sa		
1158			41422 - 1.76 Sa		
1159			41422 - 1.76 Sa		
1160			41422 - 1.76 Sa		
1161			41422 - 1.76 Sa		
1162			41422 - 1.76 Sa		
1163			41422 - 1.76 Sa		
1164			41422 - 1.76 Sa		
1165			41422 - 1.76 Sa		
1166			41422 - 1.76 Sa		
1167			41422 - 1.76 Sa		
1168			41422 - 1.76 Sa		
1169			41422 - 1.76 Sa		
1170			41422 - 1.76 Sa		
1171			41422 - 1.76 Sa		
1172			41422 - 1.76 Sa		
1173			41422 - 1.76 Sa		
1174			41422 - 1.76 Sa		
1175			41422 - 1.76 Sa		
1176			41422 - 1.76 Sa		
1177			41422 - 1.76 Sa		
1178			41422 - 1.76 Sa		
1179			41422 - 1.76 Sa		
1180			41422 - 1.76 Sa		
1181			41422 - 1.76 Sa		
1182			41422 - 1.76 Sa		
1183			41422 - 1.76 Sa		
1184			41422 - 1.76 Sa		
1185			41422 - 1.76 Sa		
1186			41422 - 1.76 Sa		
1187			41422 - 1.76 Sa		
1188			41422 - 1.76 Sa		
1189			41422 - 1.76 Sa		
1190			41422 - 1.76 Sa		
1191			41422 - 1.76 Sa		
1192			41422 - 1.76 Sa		
1193			41422 - 1.76 Sa		
1194			41422 - 1.76 Sa		
1195			41422 - 1.76 Sa		
1196			41422 - 1.76 Sa		
1197			41422 - 1.76 Sa		
1198			41422 - 1.76 Sa		
1199			41422 - 1.76 Sa		
1200			41422 - 1.76 Sa		
1201			41422 - 1.76 Sa		
1202			41422 - 1.76 Sa		
1203			41422 - 1.76 Sa		
1204			41422 - 1.76 Sa		
1205			41422 - 1.76 Sa		
1206			41422 - 1.76 Sa		
1207			41422 - 1.76 Sa		
1208			41422 - 1.76 Sa		
1209			41422 - 1.76 Sa		
1210			41422 - 1.76 Sa		
1211			41422 - 1.76 Sa		
1212			41422 - 1.76 Sa		
1213			41422 - 1.76 Sa		
1214			41422 - 1.76 Sa		
1215			41422 - 1.76 Sa		
1216			41422 - 1.76 Sa		
1217			41422 - 1.76 Sa		
1218			41422 - 1.76 Sa		
1219			41422 - 1.76 Sa		
1220			41422 - 1.76 Sa		
1221			41422 - 1.76 Sa		
1222			41422 - 1.76 Sa		
1223			41422 - 1.76 Sa		
1224			41422 - 1.76 Sa		
1225			41422 - 1.76 Sa		
1226			41422 - 1.76 Sa		
1227			41422 - 1.76 Sa		
1228			41422 - 1.76 Sa		
1229			41422 - 1.76 Sa		
1230			41422 - 1.76 Sa		
1231			41422 - 1.76 Sa		
1232			41422 - 1.76 Sa		
1233			41422 - 1.76 Sa		
1234			41422 - 1.76 Sa		
1235			41422 - 1.76 Sa		
1236			41422 - 1.76 Sa		
1237			41422 - 1.76 Sa		
1238			41422 - 1.76 Sa		
1239			41422 - 1.76 Sa		
1240			41422 - 1.76 Sa		
1241			41422 - 1.76 Sa		
1242			41422 - 1.76 Sa		
1243			41422 - 1.76 Sa		
1244			41422 - 1.76 Sa		
1245			41422 - 1.76 Sa		
1246			41422 - 1.76 Sa		
1247			41422 - 1.76 Sa		
1248			41422 - 1.76 Sa		
1249			41422 - 1.76 Sa		
1250			41422 - 1.76 Sa		
1251			41422 - 1.76 Sa		
1252			41422 - 1.76 Sa		
1253			41422 - 1.76 Sa		
1254			41422 - 1.76 Sa		
1255			41422 - 1.76 Sa		
1256			41422 - 1.76 Sa		
1257			41422 - 1.76 Sa		
1258			41422 - 1.76 Sa		
1259			41422 - 1.76 Sa		
1260			41422 - 1.76 Sa		
1261			41422 - 1.76 Sa		
1262			41422 - 1.76 Sa		
1263			41422 - 1.76 Sa		
1264			41422 - 1.76 Sa		
1265			41422 - 1.76 Sa		
1266			41422 - 1.76 Sa		
1267			41422 - 1.76 Sa		
1268			41422 - 1.76 Sa		
1269			41422 - 1.76 Sa		
1270			41422 - 1.76 Sa		
1271			41422 - 1.76 Sa		
1272			41422 - 1.76 Sa		
1273			41422 - 1.76 Sa		
1274			41422 - 1.76 Sa		
1275			41422 - 1.76 Sa		
1276			41422 - 1.76 Sa		
1277			41422 - 1.76 Sa		
1278			41422 - 1.76 Sa		
1279			41422 - 1.76 Sa		
1280			41422 - 1.76 Sa		
1281			41422 - 1.76 Sa		
1282			41422 - 1.76 Sa		
1283			41422 - 1.76 Sa		
1284			41422 - 1.76 Sa		
1285			41422 - 1.76 Sa		
1286			41422 - 1.76 Sa		
1287			41422 - 1.76 Sa		
1288			41422 - 1.76 Sa		
1289			41422 - 1.76 Sa		
1290			41422 - 1.76 Sa		
1291			41422 - 1.76 Sa		
1292			41422 - 1.76 Sa		
1293			41422 - 1.76 Sa		
1294			41422 - 1.76 Sa		
1295			41422 - 1.76 Sa		
1296			41422 - 1.76 Sa		
1297			41422 - 1.76 Sa		
1298			41422 - 1.76 Sa		
1299			41422 - 1.76 Sa		
1300			41422 - 1.76 Sa		

 RONDE & SCHWARZ MÜNCHEN	Änd.- zuel.	Änd.-Mittlg. Nr.	Datum	Name	Liste Nr. 41422 - 1.76 Sa	Liste besteht aus Blatt Blatt Nr. 3
	Datum	Name	Ersatz für Liste Stückliste / Schaltteilleiste zu FM-Verstärker (Gruppe)			
geschrieben	bearbeitet	geprüft	nachgeprüft			

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Verwertung, Mitteilung an andere ist ohne schriftliche Genehmigung strafbar und rechtlich verpöblich.

ellspause Nr.

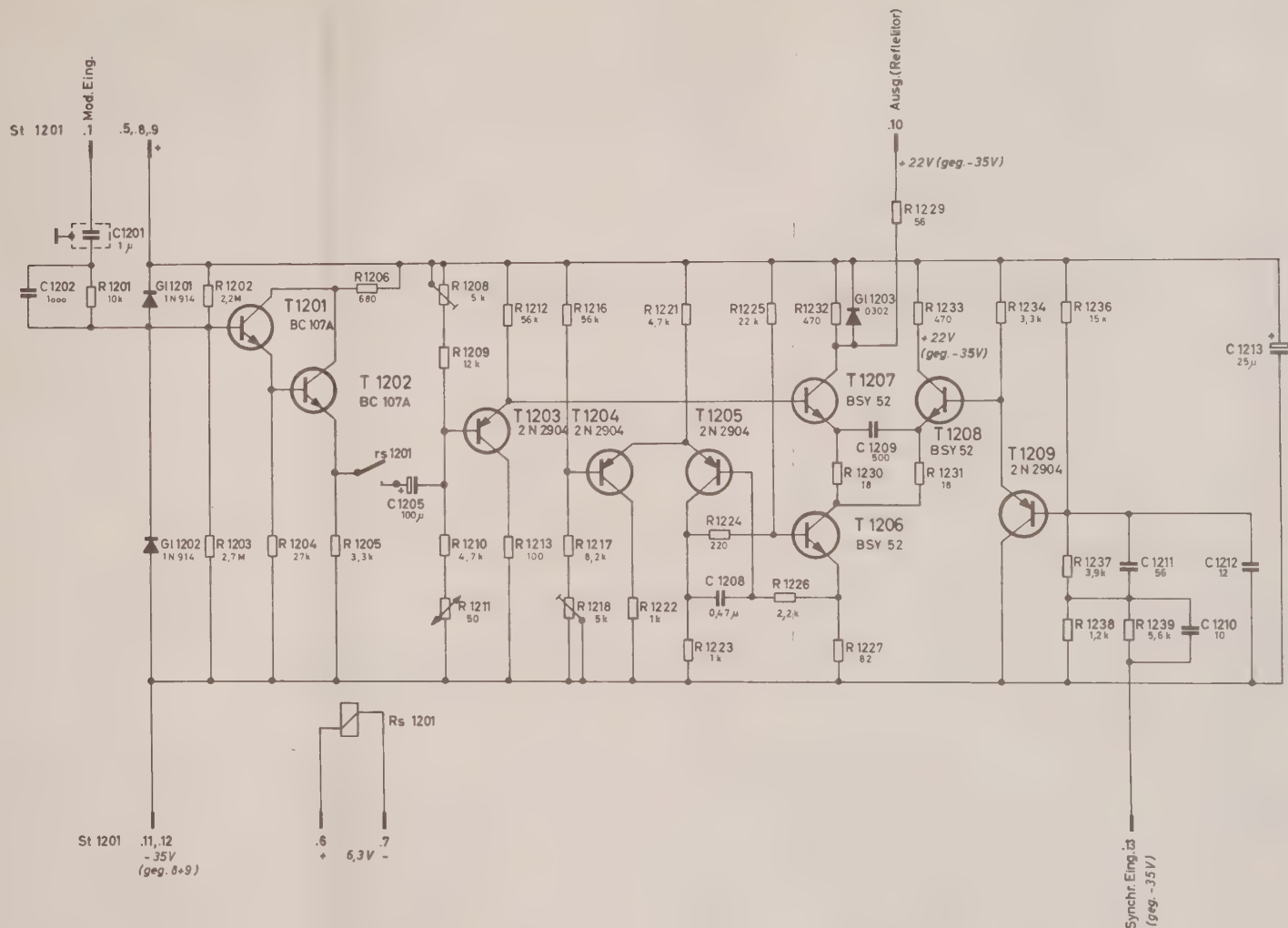
			And.- zust.	And.-Mitgl. Nr.	Datum	Name	Liste Nr.	Liste besteht aus Blatt
ROHDE & SCHWARZ MÜNCHEN			a	-	29.4.66	Volk	41422 - 1.76 Sa	Blatt Nr.
EKE			Datum	Name	Ersatz für Liste			
geschrieben			29.4.66	Volk	Schallteilleiste zu			
bearbeitet			Volk	FM-Vorstärker (Gruppe)				
geprüft			5/6					
normgeprüft								

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Vervielfältigung, Mitteilung an andere ist strafbar und schadenverursachend.

ROHDE & SCHWARZ · MÜNCHEN

Name	Tag	Ans. Nr.	Ans. Nr.	Name	Tag	Ans. Nr.	Ans. Nr.

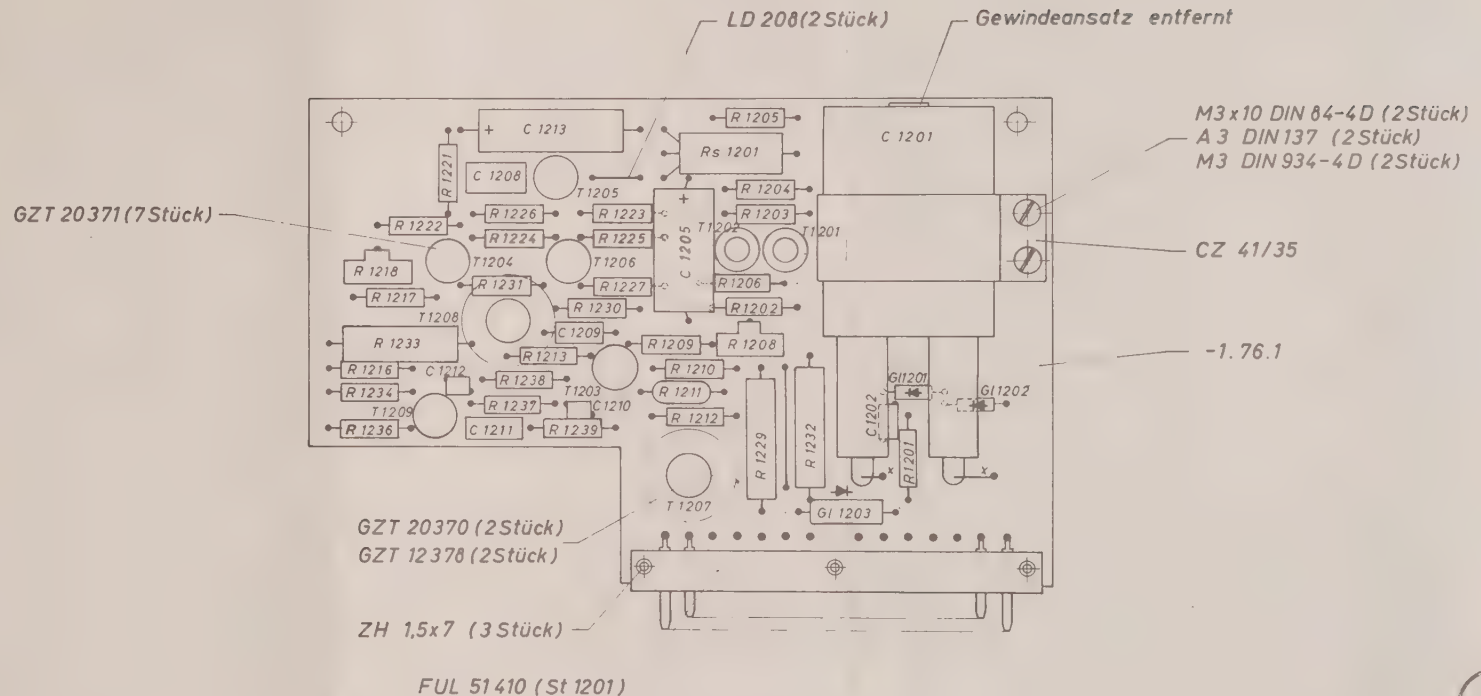
EKE	Name	Tag	Ans. Nr.	Ans. Nr.	Name
3.5.66	Mz.	3.5.66	a		
6.12.66	Volk	23.11.66	b		
		12.790	c		



Wt

hierzu Schalteilleiste 41422-1.76 Sa

Stromlauf zu	FM-Verstärker (Gr.)	Zeichn. Nr.
		41422-1.76 S



C 1201 nach dem Tauchlöten montiert und gelötet nach HVM 230

hierzu 41422 - 1.76 S
41422 - 1.76 St

ROHDE & SCHWARZ MÜNCHEN			Halbzeug, Werkstoff			Untolerierte Maße		Zeichn. Nr. 41422-1.76
EKD	Tag	Name	And.- zuf.	And.-Mittlg. Nr.	Tag	Name	Maßstab 1:1	
gezeichnet	11.5.66	Wm	a	-	21.11.66	Fre		
bearbeitet			b	12790	21.3.67	Rd		
geprüft								
normgepr.								

FM-Verstärker (Gr.)

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Weiterleitung, Mithaltung an andere ist ohne schriftliche Genehmigung strafbar und schadenersatzpflichtig.

1 Anm.- zeichen	2 Stück- zahl	3 Bezeichnung	4 Zust.-Nr.	5	6 Bemerkungen
Bu301		Gerätebuchse	FHM 14041/50		
Bu302		Gerätebuchse	FHM 14041/50		
Bu303		Gerätebuchse	FHM 14041/50		
Bu304		Gerätebuchse	FHM 14041/50		
BuA1		Buchse			enth. in St301
BuA2		Buchse			enth. in St301
C301		Keramik-Kondensator	CCG 41/6		
C302		Kf-Kondensator	CKG 50053 n 100		
C303		Kf-Kondensator	CKG 50053 n 470		
C305		Keramik-Kondensator	CCG 68/10		
C306		Keramik-Kondensator	CCG 68/6		
C307		Kf-Kondensator	CKG 50053 n 100		
C308		Kf-Kondensator	CKG 50053 n 470		
C309		Elko	CED 21/25/35		
C312		Keramik-Kondensator	CCH 68/450		
C313		Papier-Kondensator	CPF 4700/250		
C314		Papier-Kondensator	CPK 58003 n 47		
C315		Ks-Kondensator	CKL 44443 u 0,47		

Arbeitspauze Nr.

 ROHDE & SCHWARZ MÜNCHEN		Änd.- zust.	Änd.-Mitgl. Nr.	Datum	Name	Liste Nr. R 17542 Bl.11 -41422 - 5-8a	Liste besteht aus 8 Blatt Blatt Nr. 1
		EKE Datum Name geschrieben 24.1.66 Volk bearbeitet Volk geprüft normgeprüft					Ersatz für Liste Schalttafel zu Modulationseinschub (Gruppe)

Arbeitspauze Nr.

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und Schadensersatzpflichtig.

Arbeits- Zeichen	Blatt- zahl	Benennung	Sach-Nr.		Bemerkungen
1	2	3	4	5	6
C318		Kf-Kondensator	CKG 50053 n 470		
C319		Keramik-Kondensator	CCG 68/10		
C320		Keramik-Kondensator	CCG 94/1000		
C323		Keramik-Kondensator	CCG 50960 n 10		
C324		Kf-Kondensator	CKG 50053 n 470		
C327		Kf-Kondensator	CKG 50033 n 100		
C328		Papier-Kondensator	CPK 58003 n 10		
C329		Kf-Kondensator	CKD 2/1000/125		
C330		Keramik-Kondensator	CCH 31/82		
C331		Kf-Kondensator	CKG 50053 n 470		
C334		Keramik-Kondensator	CCG 94/1000		
C337		Keramik-Kondensator	CCG 50960 n 10		
C338		Kf-Kondensator	CKG 50053 n 470		
C341		Kf-Kondensator	CKG 50033 n 100		
C342		Papier-Kondensator	CPK 58003 n 10		
C343		Kf-Kondensator	CKD 2/1000/125		

revi/fäll.-Pause Nr.


ROHDE & SCHWARZ
MÜNCHEN

NAME	Datum	Name
geschrieben	24.1.66	Volk
bearbeitet		Volk
geprüft		St
nachgeprüft		

Arbeitspause Nr.

Änd. ausl	Änd. Mittlg Nr	Datum	Name

Liste Nr.	R 17542 B1.12
	11.22 - 5 Sa
Legen für Liste	
Gezeichnet/ Schalterfilete zu	
	Modulationseinschub (Gruppe)

Liste besteht aus	Blatt
Blatt Nr.	2

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Verwertung, Mitteilung an andere ist strafbar und Schadensersatzpflichtig.

1 DIN Zeichen	2 Stück- zahl	3 Benennung	4 Sach-Nr.	5	6 Bemerkungen
G344		Keramikk-Kondensator	CEH 11/97		
G1301		Kristall-Diode	GK/AAZ 13		
G1302		Kristall-Diode	GK/Z 8		
G1304		Kristall-Diode	GK/1 N 914		
G1305		Kristall-Diode	GK/AAZ 13		
G1307		Kristall-Diode	GK/AAZ 13		
G1308		Kristall-Diode	GK/AAZ 10		
G1309		Kristall-Diode	GK/OA 182		
G1310		Kristall-Diode	GK/Z 8		
G1312		Kristall-Diode	GK/AAZ 13		
G1313		Kristall-Diode	GK/AAZ 13		
G1315		Kristall-Diode	GK/AAZ 13		
G1316		Kristall-Diode	GK/AAZ 10		
G1317		Kristall-Diode	GK/OA 182		
G1318		Kristall-Diode	GK/Z 8		
G1320		Kristall-Diode	GK/AAZ 13		
G1321		Kristall-Diode	GK/AAZ 13		

rvief/011.-Pause Nr.

ROHDE & SCHWARZ
MÜNCHEN

gezeichnet Datum Name

gezeichnet 24.1.66 Volk

gezeichnet Volk

gezeichnet

gezeichnet

Änd.- zust.	Änd.-Mitg. Nr.	Datum	Name
a	-	2.3.66	Volk
b	-	25.11.66	Volk

Liste Nr.	N 17342 Bl. 75
Liste besteht aus Blatt	44422- - 5-Str
Blatt Nr.	3

Ersatz
für Liste

MAXIMALE Schaffteilliste zu

Modulationseinschub (Gruppe)

Arbeitspause Nr.

Arbeitsbogen Nr.

1	2	3	4	5	6
Stück- zahl	Bezeichnung	Sach-Nr.			Bemerkungen
R309	Schichtwiderstand	WFE 321 k 27			
R310	Schichtwiderstand	WFE 321 E 390			
R311	Schichtwiderstand	WFE 321 k 2,7			
R312	Schicht-Drehwiderst.	WSG 11000/10 k			
R313	Schichtwiderstand	WFE 321 k 300			
R314	Schichtwiderstand	WFE 321 k 56			
R315	Schichtwiderstand	WFE 321 k 120			
R316	Schichtwiderstand	WFE 321 E 470			
R317	Schichtwiderstand	WFE 321 E 150			
R318	Schichtwiderstand	WFE 321 k 15			
R319	Schichtwiderstand	WFE 321 E 10			
R320	Schichtwiderstand	WFE 321 k 330			
R321	Schichtwiderstand	WFE 321 M 1			
R324	Schicht-Drehwiderst.	WS 9122 F/250 k			
R325	Schichtwiderstand	WFE 321 k 15			
R328	Schichtwiderstand	WFE 321 E 100			
R329	Schicht-Drehwiderst.	WSG 11000/5 k			
R330	Schichtwiderstand	WFE 321 k 82			
R331	Schichtwiderstand	WFE 321 E 10			
R332	Schichtwiderstand	WFE 321 k 1			
R344	Schichtwiderstand	WFE 321 k 1			

 RONDE & SCHWARZ MÜNCHEN		And.- zus.	And.-Mitgl. Nr.	Datum	Name	Liste Nr.	R 17542 Bl.15	Liste besteht aus	Blatt
geschrieben		24.1.66		Volk		4422-5-84		Blatt Nr.	
bearbeitet		Volk		Ersatz für Liste		4422-5-84		Blatt Nr.	
geprüft		Volk		Ersatz für Liste		4422-5-84		Blatt Nr.	
modifiziert		Volk		Ersatz für Liste		4422-5-84		Blatt Nr.	

Modulationseinschub (Gruppe)

Urk.
Nr.
Kenn-
zeichen

Stück-
zahl

Benennung

Sach-Nr.

Bezeichnungen

R363 Schichtwiderstand WFE 321 E 10

R365 Schichtwiderstand WFE 321 E 10

R366 Schichtwiderstand WFE 321 k 1

R367 Schicht-Drehwiderst. WSG 11000/500

R370 Schichtwiderstand WFE 321 k 2,2

R371 Schicht-Drehwiderst. WS 9122 F/25 k

R372 Schichtwiderstand WFE 321 E 470

R373 Schichtwiderstand WFE 321 E 560

R374 Schichtwiderstand WFE 321 E

S301 Stufenschalter 41422 - 5.4

S302 Stufenschalter 41422 - 5.4

S303 Stufenschalter 41422 - 5.4

S304 Schiebeschalter SSB 12310

Diese Zeichnung ist einer Ersetzung, Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzfähig.

RONDE-SCHWARZ
München

14.1.66 Volk

Volk

Datum	Name
3.3.66	Volk
25.11.66	Volk

Urk. Nr.

R 17542 Bl.17

41422 - 5-8a

Ersatz
für Liste

SCHWABE / Schallteilleiste zu

Liste besteht

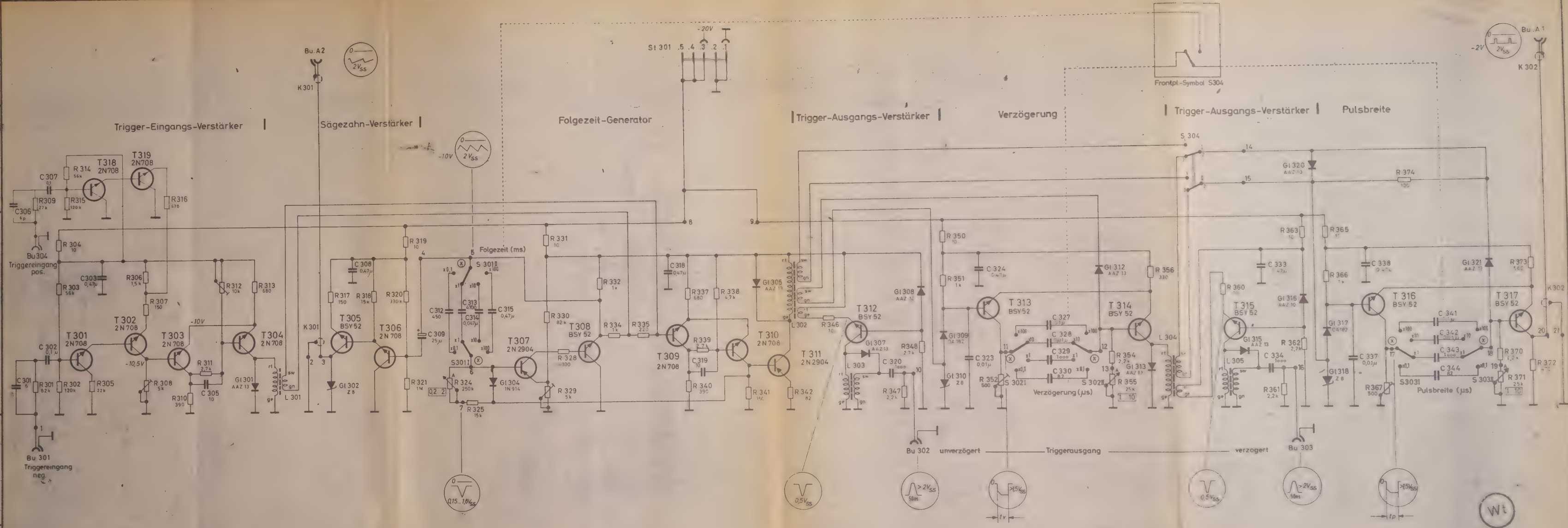
aus Blatt

Blatt Nr.

7

Modulationseinschub (Gruppe)

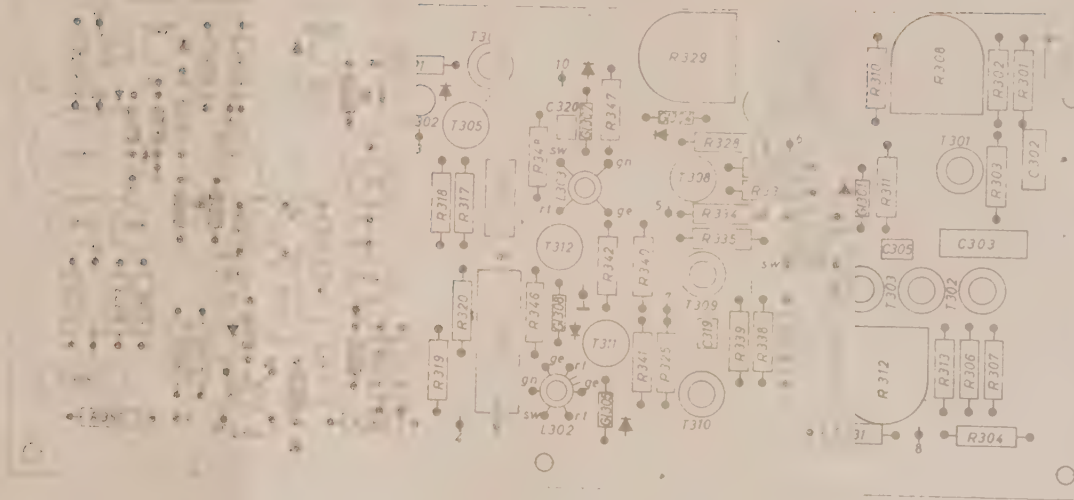
 ROHDE & SCHWARZ MÜNCHEN	And.- zuef.	And.-Mitgl. Nr.	Datum	Name	Liste Nr. R 17542 Bl.18	Liste besteht aus Blatt
	o 17 790	-	1.3.66 Volk	5.3.67 Volk	+1422-15-Sa	Blatt Nr. 8
Datum	Name		Ersatz für Liste			
geschrieben 14.1.66 Volk	Volk		Schalte / Schalttafel zu			
bearbeitet	B4		Modulationseinschub (Gruppe)			
geprüft						
normgeprüft						



⊛ Schleiferfeder auf Seite der Verdrehungsschutznahe.
(Kondensatoren nach Einschuboberseite.)

423-164 (3Stck.)

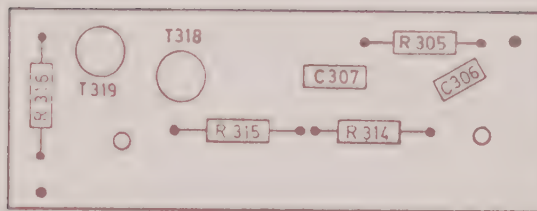
21 20371 (17Stck.)



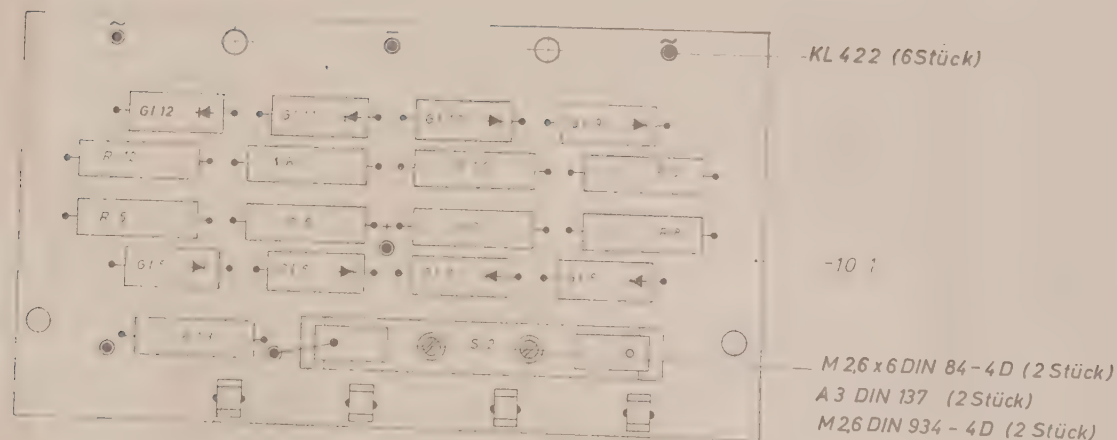
- ♣ KLL 30804 (22Stck)
- ♣ Schlitzrichtung der Lötöse

hierzu 41422-5.2 St

ROHDE & SCHWARZ MUNICH		Halbzeug, Werkstoff		gezeichnete Maße		Zeichn. Nr. 41422-5.2	
E.K.D. Tag. Nr.		And. - And. Mittlg. Nr.		Maßstab		1:1	
21.2.66 Wt		a 13565 0.3.60 Ln		Name		Platte (G)	



Pos.- Plan des pos. Eingangs - Verstärkers



FD 504/12 nach dem Tauchloten montiert und gelötet nach HVM 230
EU 25002-4 8.4 (4 Stück)

hierzu 41422-10 St

 ROHDE & SCHWARZ MEßGERÄTE		Halbzeug, Werkstoff		Unterschieds-Maße		Zeichn.-Nr.	
				Maßstab		41422-10	
EKD	Datum	Name	Ans. Zust.	Ans. Zust.	Datum	Name	
	4.4.66	mem	a	14080	21.69	Lr	

Kenn- zeichn.	Stück- zahl	Benennung	Sach-Nr.	Bemerkungen	
1	2	3	4	5	6
C401		Elko	CED 21/100/70		
C402		Kf-Kondensator	CKG 50054 u 2,2		
C403		Elko	CED 21/100/70		
G1401		Kristall-Diode	GK/Z 12		
G1402		Kristall-Diode	GK/Z 12		
G1406		Kristall-Diode	GK/Z 8		
G1407		Kristall-Diode	GK/Z 8		
R401		Schichtwiderstand	WFE 321 k 1		
R402		Schichtwiderstand	WFE 321 k 15		
R403		Schichtwiderstand	WFE 321 k 22		
R404		Schichtwiderstand	WFE 321 k 1		
R406		Schichtwiderstand	WFE 321 k 1		
R407		Schichtwiderstand	WFE 321 E 680		
R408		Heißeleiter	WHD 452/130/10		



ROHDE & SCHWARZ
MÜNCHEN

EKE	Datum	Name
geschrieben	20.1.66	Volk
bearbeitet		Volk
geprüft		St
normgeprüft		

Änd.- zust.	Änd.-Mittig Nr.	Datum	Name

Liste Nr.

41422 - 41 Sa

Liste besteht

aus 2 Blatt

Blatt Nr.

1

Entwurf
für Liste

Entwurf / Schalttafelkarte zu

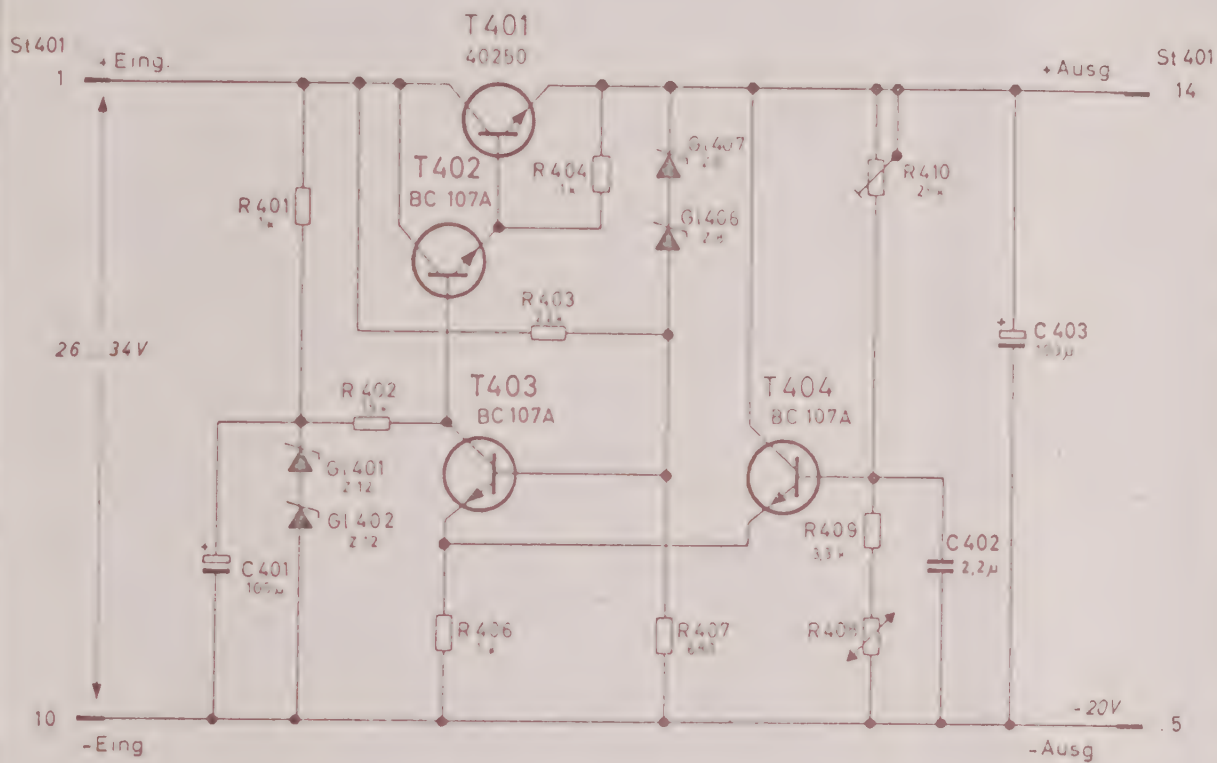
20-V-Regelteil (Gruppe)

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Vervielfältigung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

Arbeitspausen Nr.

Arbeitspausen Nr.

20.0665.100.S

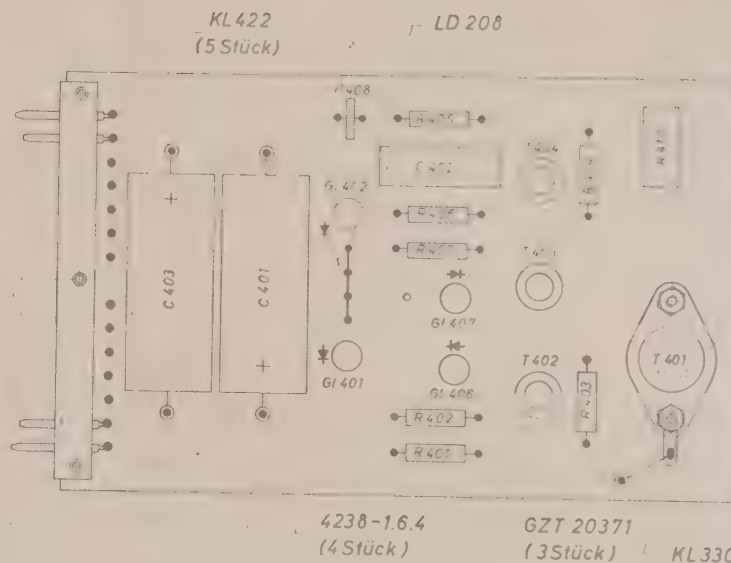


hierzu Schaltteilliste 41422 - 41 Sa

 ROHDE & SCHWARZ MÜNCHEN		Halbzeug, Werkstoff		Untolerierte Maße		Zeichn. Nr.	
				Maßstab		41422 - 415	
EKE	Tag	Name	Änd. zust.	Änd.-Mittlg Nr.	Tag	Name	Ersatz f. Zeichn.
gezeichnet	28.12.65	Mz	a	12790	3.3.67	Volk	Stromlauf zu 20-V-Regelteil (Gr.)
bearbeitet		Volk					
geprüft							
normgepr.							

FUL 51410
(SI 401)

ZH 1,5x7
(3Stück)



- 41.1

ZH 2 x 22
(2 Stück)

M3x12 DIN 84-4 D (2 Stück)

A3 DIN 137 (2 Stück)

ZXD 11011/3 (2 Stück)

ZFJ 3

M3 DIN 934-4 D (2 Stück)

T401, C401, C403 nach dem Tauchlöten montiert und gelötet nach HVM 230

hierzu 41 422-41S
41 422-41SI

RS		Halbzeug, Werkstoff		Unfolierte Maße		Zeichn. Nr.	
ROHDE & SCHWARZ MÜNCHEN						41 422 - 41	
EKD		Datum		Name		Maßstab	
		And. zust.		And. Hmly. Nr.		1 : 1	
gezeichnet		14.4.66		Wk		a 13565 0.3.68 Ln	
bearbeitet							
geprüft							

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und Schadensersatzpflichtig.

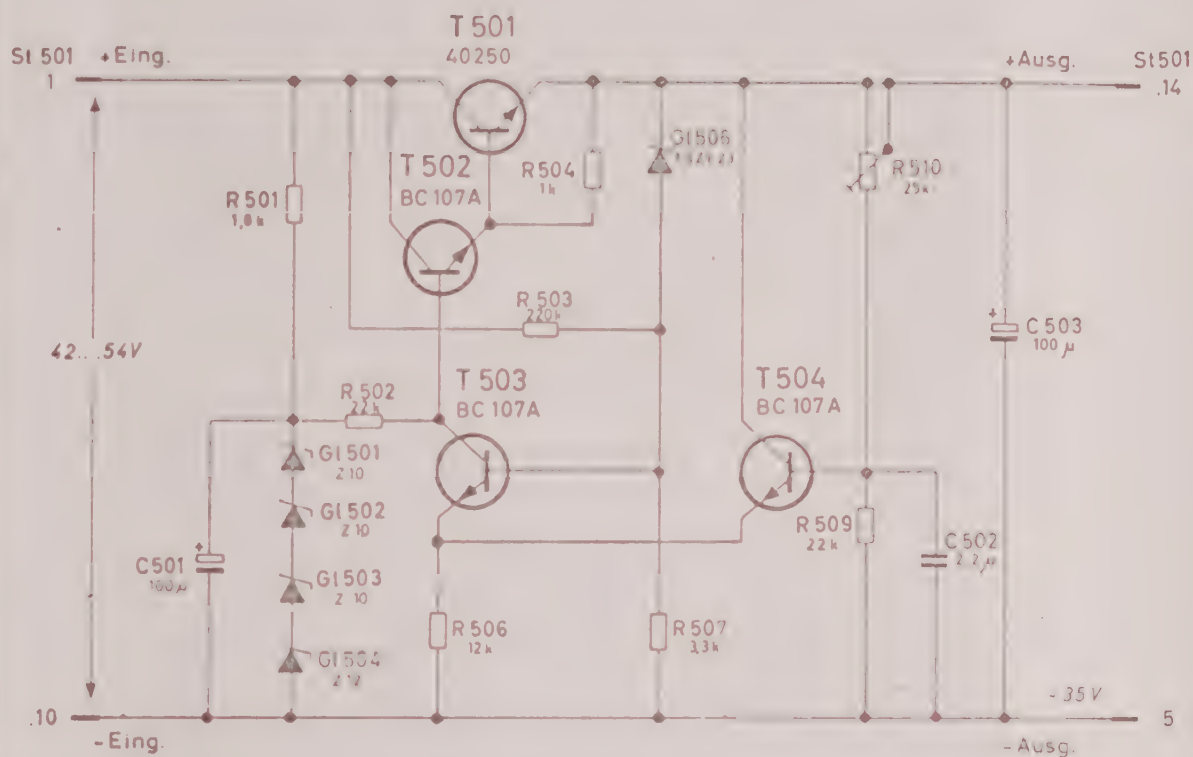
1 Stück zeichen	2 Stück zahl	3 Benennung	4 Sach-Nr.	5 Bemerkungen
C501		Elko	CND 21/100/70	
C502		Kf-Kondensator	CKG 50054 u 2,2	
C503		Elko	CND 21/100/70	
G1501		Kristall-Diode	GK/Z 10	
G1502		Kristall-Diode	GK/Z 10	
G1503		Kristall-Diode	GK/Z 10	
G1504		Kristall-Diode	GK/Z 12	Trimmwert
G1506		Kristall-Diode	GK/BZY 23	
R501		Schichtwiderstand	WFE 321 k 1,8	
R502		Schichtwiderstand	WFE 321 k 22	
R503		Schichtwiderstand	WFE 321 k 220	
R504		Schichtwiderstand	WFE 321 k 1	
R506		Schichtwiderstand	WFE 321 k 12	
R507		Schichtwiderstand	WFE 321 k 3,3	

Arbeitspausen-Nr.

			Änd.- zust.	Änd.-Mittig Nr.	Datum	Name	Liste Nr.	Liste besteht aus 2 Blatt	
ROHDE & SCHWARZ MÜNCHEN							41422 - 42 Sa	Blatt Nr. 1	
gkz	Datum	Name	35-V-Regelteil (Gruppe)						
geschrieben	20.1.66	Volke							
bearbeitet		Volke							
geprüft		BC							
normgeprüft									

Arbeitspausen-Nr.

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Weiterverkauf, Mithilfe an anderen ist strafbar und schadenstiftend.



hierzu Schalterliste 41422-42 Sa

 ROHDE & SCHWARZ MÜNCHEN		Halbleit., Werkstoff		Unterschiedliche Maße		Zeichn. Nr.	
				Maßstab		41422-42 S	
EKE	Tag	Name	And. ruzl.	And. Mittlg. Nr.	Tag	Name	Ersatz f. Zeichen
gezeichnet	28.12.65	Mz	a	12790	3.3.67	Volk	
bearbeitet		Volk					
geprüft		Bc					
normgepr.							
Stromlauf zu							35-V-Regelteil (Gr.)

Verliefen - Pause

Arbeitspause Nr.

Wt

 ROHDE & SCHWARZ MÜNCHEN	Halbzeug, Werkstoff		Unterteilte Maße		Zeichn. Nr.	
			Maßstab		41422 - 42	
EKD Datum Name gr. Kessel 6 4 66 VK Bauteilnr. daz. Nr. 1000000	And. Datum 13.565	And. Menge 0,3.68	Datum 1.1	Name Ln	Ersatz- Zahn	
35V-Regelteil (Gr.)						

Arbeitspage Nr.

RS ROHDE & SCHWARZ MÜNCHEN			Anord. zust.	And.-Mittlg. Nr.	Datum	Name	Liste Nr.	Liste besteht aus Blatt	
			a	-	11.3.66	Volk	41422 - 43 Sa	Blatt Nr. 2	
EKE	Datum	Name							
geschrieben	20.1.66	Volk					Erstz für Liste		
bearbeitet		Volk					Stückliste / Schalttailliste zu		
geprüft		Be					4...18-V-Regelteil (Gruppe)		
normgeprüft									

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Vervielfältigung, Mithilfe an andere ist strafbar und schadenersatzpflichtig.

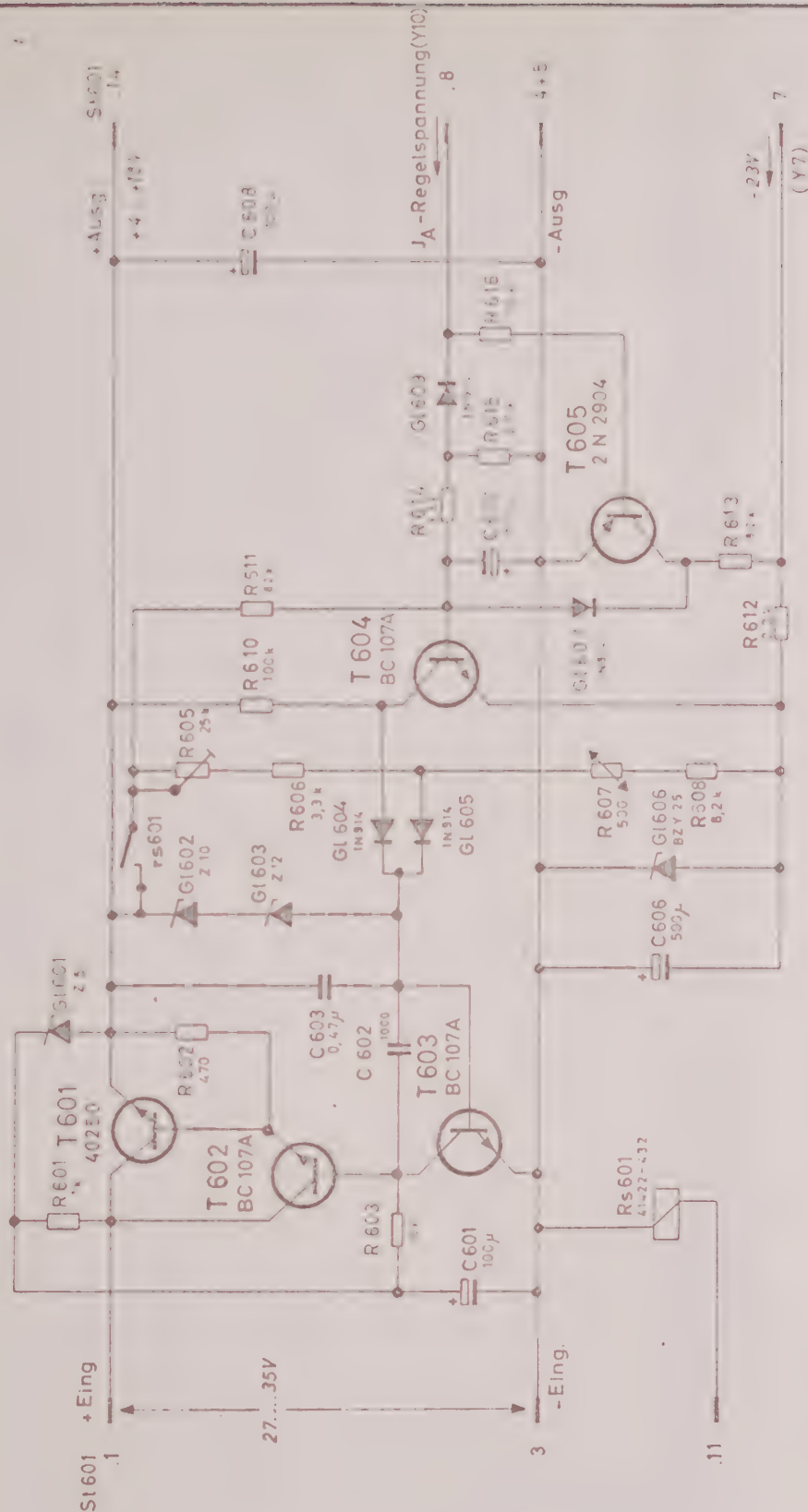
1 Stück- Nr. & Kenn- zeichen	2 Stück- zahl	3 Benennung	4 Sach-Nr.	5	6 Bemerkungen
St601		Steckerleiste	FUL 51410		
T601		Transistor	GT/40250		
T602		Transistor	GT/BC 107 A		
T603		Transistor	GT/BC 107 A		
T604		Transistor	GT/BC 107 A		
T605		Transistor	GT/2 N 2904		

Blatt.-Pause Nr.

Blattpause Nr.

RS ROHDE & SCHWARZ MÜNCHEN			Änd.- zus.	Änd.-Mitgl. Nr.	Datum	Name	Liste Nr.	Liste besteht aus Blatt	
			c	12790	3.3.67	Volk	44422 - 43 Sa	Blatt Nr. 3	
EKE	Datum	Name							
geschrieben	20.1.66	Volk							
bearbeitet		Volk							
geprüft		BC							
normgeprüft									
Ersatz für Liste									
Stückliste / Schaltteilliste zu									
4...18-V-Regelteil (Gruppe)									

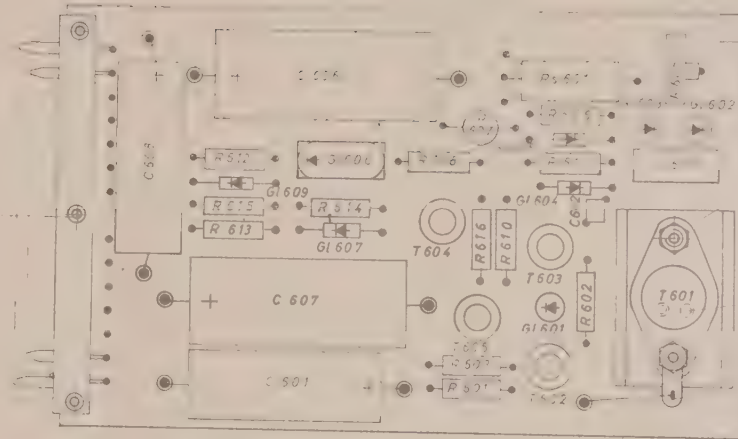
Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Verwertung, Mitteilung an andere ist strafbar und schadenverursachend.



hierzu Schalterliste 41422-43 Sa

 ROHDE & SCHWARZ MÜNCHEN			Halbzeug, Werkstoff			Untolerierte Maße		Zeichn. Nr.	
						Maßstab		41422 - 43 S	
EKE	Tag	Name	Ans. / And.-Mittlg. / Erst / Nr.		Tag	Name	Ersatz f. Zeichn.		
gezeichnet	29.12.65	Mz	a	—	11.3.66	Volk	Stromlauf zu		
bearbeitet		Volk	b	—	11.5.66	Volk	4...18-V-Regelteil (Gr.)		
geprüft		SV	c	12790	3.3.67	Volk			
normgepr.									

KL 422 (9 Stück)



KL 330

GZ T 20371
(4 Stück)

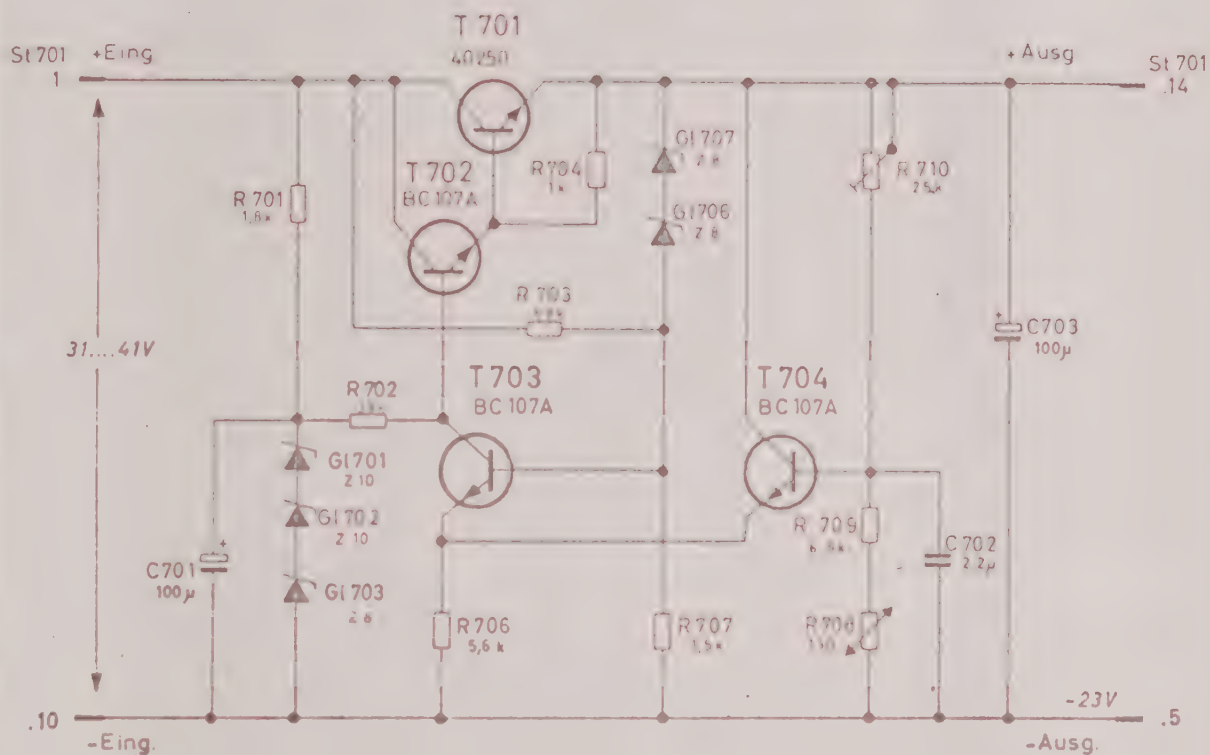


ATION,
t
C
C
P, sc
used Nr

 ROHDE & SCHWARZ MÜNCHEN	Hilfszeug, Werkstoff		Untolerierte Maße	Zeichn. Nr. 4 14 22 - 43
			Maßstab	
	EKD Datum Name 12.4.66 Hem bearbeitet geprüft	Art 13565 Maß 8,3.68 Datum 1.3.68 Name Ln	1 : 1 4...18V - Regelteil (Gr.)	

Arbeitspasse Nr.

Arbeitspasse Nr.



 ROHDE & SCHWARZ MÜNCHEN		Halbzeug, Werkstoff		Untolerierte Maße		Zeichn. Nr. 41422-44 S	
				Maßstab			
EKE	Tag	Name	Änd. zust.	Änd. Mittlg. Nr.	Tag	Name	Ersetzt f. Zeichn.
gezeichnet	28.12.65	Mz	a	—	21.11.66	Volk	Stromlauf zu 23-V-Regelteil (Gr.)
bearbeitet		Volk	b	12790	3.3.67	Volk	
geprüft		<i>RS</i>					
normgepr.							

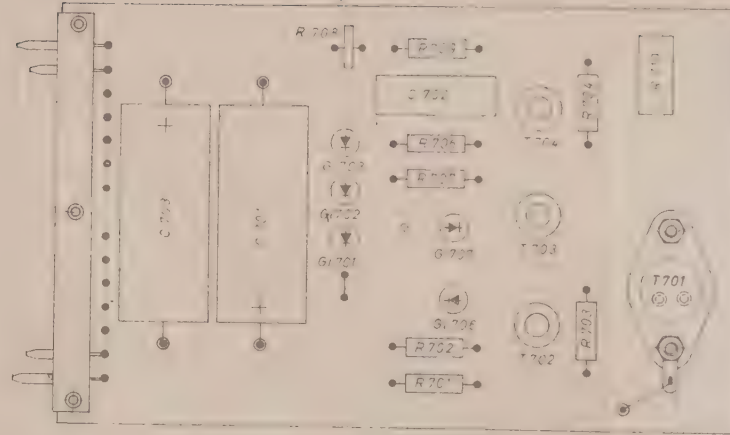
FUL 51410 --
(St 701)

ZH 1,5 x 7 --
(3 Stück)

4238-16.4
(5 Stück)

GZT 20371
(3 Stück)

- 44.1



- M3 x 12 DIN 84 - 4 D (2 Stück)
- ZXD 11011/3 (2 Stück)
- A 3 DIN 137 (2 Stück)
- ZFJ 3
- M3 DIN 934 - 4 D (2 Stück)

ZH 2 x 2 Z
(2 Stück)

KL 422
(5 Stück)

LD 208

KL 330

T 701, C 701 u. C 703 nach dem Tauchlöten montiert und gelötet nach HVM 230

Wt

hierzu 41422 - 44 S
41422 - 44 St

ROHDE & SCHWARZ MÜNCHEN		Halbzeug, Werkstoff		Untolerierte Maße		Zeichn. Nr.	
EKD		Datum		Name		Maßstab	
gezeichnet		2.5.66		Ln		1:1	
bearbeitet		a 13.565		8.3.68		Ln	
geprüft							

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und Schadensersatzpflichtig.

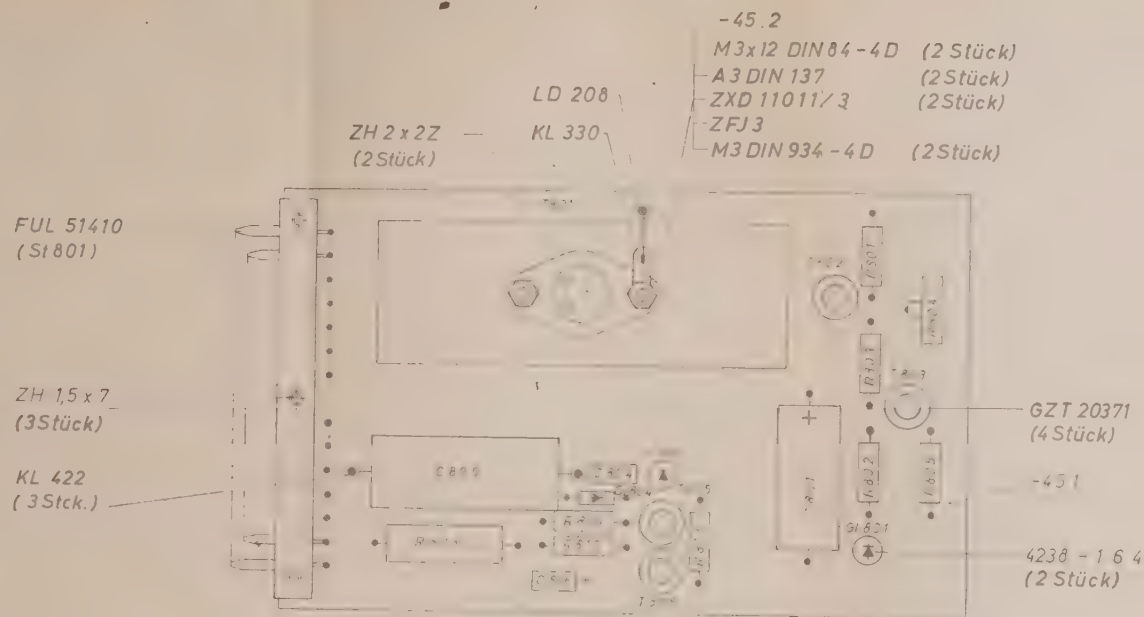
Pos. Zeichen	Stück- zahl	Benennung	Sach-Nr.		Bemerkungen
1	2	3	4	5	6
C801		Elko	CGD 22/100/15		
C804		Keramik-Kondensator	CCG 50960 n 10		
C805		Ks-Kondensator	CKL 44643 u 10		
C1801		Kristall-Diode	GK/Z 5		
C1804		Kristall-Diode	GK/1 N 914		
C1805		Kristall-Diode	GK/E 10		
R801		Schichtwiderstand	WFE 321 k 2,2		
R802		Schichtwiderstand	WFE 321 E 100		
R803		Schichtwiderstand	WFE 321 E 100		
R804		Schicht-Drehwiderst.	WBG 11010/1 k		
R805		Schichtwiderstand	WFE 321 k 3,9		

el/falt.-Pause Nr.

beitspause Nr.

		Änd.- zust.	Änd.-Mittlg. Nr.	Datum	Name	Liste Nr.	Liste besteht aus 2 Blatt
ROHDE & SCHWARZ MÜNCHEN						41422 - 45 Sa	Blatt Nr. 1
geschrieben	20.1.66 Volk					Ersatz für Liste	
bearbeitet	Volk					SGS&Bü. / Schaltteilliste zu	
geprüft	SC					6,3-V-Regelteil (Gruppe)	
normgeprüft							

 ROHDE & SCHWARZ MÜNCHEN	And - And - Mittig zwisch. Nr.	Datum	Name	Liste Nr. aus Blatt Blatt Nr.
	12720	3.3.67	Volk	
EKE	Datum	Name		
geschrieben	20.1.66	Volk		
bearbeitet		Volk		
geprüft		BL		
normgeprüft				
Ersatz für Liste				Liste Schattenteil zu
				6,3-V-Regelteil (Gruppe)



-45.2 T801 nach dem Tauchlöten montiert,
C 005 gelötet nach HVM 230



hierzu 41422-45S
41422-45 St

ROHDE & SCHWARZ MÜNCHEN		Halbzeug, Werkstoff		Untolerierte Maße		Zeichn. Nr.	
EKD		Datum		Name		Maßstab	
13.4.66		Hem		a 13565		1:1	
b 14080		7.1.69		Ln		41422-45	
Fre						6,3V-Regelung u. Einschaltstrom	

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Weitergabe an andere ist strafbar und schadenbringend. Gekauft.

Pos. Nr. Komm. Zeichen	Stück Zahl	Benennung	Sach-Nr.		Bemerkungen
2	1		4	5	6
C2201		Tantal-Elko	CEU 36543 u 100		
C2202		Keramik-Kondensator	CCH 68/100		
C2203		Tantal-Elko	CEU 36543 u 100		
C2205		MKT-Kondensator	CKG 50053 n 470		
C2207		MKT-Kondensator	CKG 50053 n 470		
C2208		Tantal-Elko	CEV 36323 u 4,7		
G12201		Kristall-Diode	GK/1 N 914		
G12203		Kristall-Diode	GK/1 N 914		
G12204		Kristall-Diode	GK/1 N 914		
G12205		Kristall-Diode	GK/1 N 914		
G12207		Kristall-Diode	GK/OA 182		
G12208		Kristall-Diode	GK/OA 182		
G12209		Kristall-Diode	GK/OA 182		
G12211		Kristall-Diode	GK/1 N 914		
G12212		Kristall-Diode	GK/1 N 914		
G12213		Kristall-Diode	GK/1 N 914		

Blatt.-Pause Nr.

Beilapause Nr.

			Änd.- Zust.	Änd.-Mittlg Nr.	Datum	Name	Liste Nr.	Liste besteht aus 4 Blatt
ROHDE & SCHWARZ MÜNCHEN							414222 - 20 Sa	Blatt Nr. 1
1 CDE	Datum	Name						
geschrieben	13.9.67	Volk					Ersetz für Liste	
bearbeitet		Volk					SIGGARDT/KI Schaltteile zu	
geprüft		ELC					Regelverstärker (Gruppe)	
normgeprüft								

Diese Zeichnung ist unser Eigentum Vervielfältigung, Verbreitung, Weiterleitung, Abfertigung, Verwertung, Mithilfe an andere, Strafbare und schadenstiftende Handlungen.

 Kennzeichen	Stückzahl	Benennung	Sach-Nr.	Bemerkungen
1	2	3	4	5
R2201		Schichtwiderstand	WFE 321 k 180	
R2202		Schichtwiderstand	WFE 321 k 18	
R2203		Schichtwiderstand	WFE 321 E 680	
R2204		Schichtwiderstand	WFE 321 k 180	
R2207		Schichtwiderstand	WFE 321 k 82	
R2208		Schichtwiderstand	WFE 321 k 18	
R2209		Schichtwiderstand	WFE 321 k 920	
R2210		Schichtwiderstand	WFE 321 k 1,8	
R2211		Schichtwiderstand	WFE 321 k 0,8	
R2212		Schichtwiderstand	WFE 321 k 18	
R2213		Schichtwiderstand	WFE 321 k 18	
R2214		Schichtwiderstand	WFE 321 k 1	
R2215		Schichtwiderstand	WFE 321 k 10	
R2218		Schicht-Drehwiderst.	WSG 11010/500	
R2219		Schicht-Drehwiderst.	WSG 11010/500	
R2220		Schicht-Drehwiderst.	WSG 11010/500	
R2221		Schichtwiderstand	WFE 321 k 2,2	
R2222		Schichtwiderstand	WFE 321 k 100	
R2223		Schichtwiderstand	WFE 321 k 150	
R2224		Schichtwiderstand	WFE 321 E 100	

Blattförmig - Pause Nr.

Blattförmig - Pause Nr.

		Änd.-zus.	Änd.-Nr.	Mittig.-Nr.	Datum	Name	Liste Nr.	Liste besteht aus Blatt	
ROHDE & SCHWARZ MÜNCHEN							414222 - 20 Sa	Blatt Nr. 2	
1 CDE	Datum	Name							
geschrieben	13.9.67	Volk		Ersatz für Liste					
bearbeitet		Volk		Schaltteilteile zu					
geprüft		BC		Regelverstärker (Gruppe)					
normgeprüft									

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und Schadensersatzpflichtig.

Stück- X Numm- zeichen	Stück- zahl	Benennung	Sach-Nr.		Bemerkungen
1	2	3	4	5	6
R2227		Schicht-Drehwiderst.	WSG 11010/5 k		
R2228		Schichtwiderstand	WFE 321 k 1,5		
R2229		Schichtwiderstand	WFE 321 k 100		
R2230		Schichtwiderstand	WFE 321 k 18		
R2231		Schichtwiderstand	WFE 321 E 82		
R2233		Schichtwiderstand	WFE 321 k 10		
R2234		Schichtwiderstand	WFE 321 k 27		
R2235		Schichtwiderstand	WFE 321 k 15		
R2236		Schichtwiderstand	WFE 321 k 82		
R2237		Schichtwiderstand	WFE 321 k 27		
R2238		Schichtwiderstand	WFE 321 k 390		
R2241		Schichtwiderstand	WFE 321 k 5,6		
R2242		Schichtwiderstand	WFE 321 k 3,3		
R2243		Schichtwiderstand	WFE 321 k 100		
R2244		Schichtwiderstand	WFE 321 E 180		
R2245		Schichtwiderstand	WFE 321 k 18		
R2248		Schichtwiderstand	WFE 321 k 4,7		
R2249		Schichtwiderstand	WFE 321 k 10		
R2250		Schichtwiderstand	WFE 321 k 2,2		
R2251		Schichtwiderstand	WFE 321 k 150		
R2252		Schichtwiderstand	WFE 321 k 22		

vielfält.-Pause Nr.

Arbeitspause Nr.

RS ROHDE & SCHWARZ MÜNCHEN			Änd.- zust.	Änd.-Mittlg Nr.	Datum	Name	Liste Nr.	Liste besteht aus Blatt	
							414222 - 20 Sa		
1 CDE	Datum	Name						Blatt Nr. 3	
geschrieben	13.9.67	Volk					Ersatz für Liste		
bearbeitet		Volk					Schaltteilliste zu		
geprüft		BC					Regelverstärker (Gruppe)		
normgeprüft									

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

Kat. Ausg. Zeichen	Stück- zahl	Benennung	Sach-Nr.	Bemerkungen
1	2	3	4	5
R2255		Schichtwiderstand	GFA 321 K 1	
St2201		Steckerleiste	FUL 51410	
T2203		Transistor	GT/BC 107 A	
T2202		Transistor	GT/BC 107 A	
T2203		Transistor	GT/BC 107 A	
T2204		Transistor	GT/BC 107 A	
T2205		Transistor	GT/2 N 3702	
T2206		Transistor	GT/BC 107 A	
T2207		Transistor	GT/BC 107 A	
T2208		Transistor	GT/2 N 3702	
T2209		Transistor	GT/BC 107 A	
T2210		Transistor	GT/BC 107 A	
T2211		Transistor	GT/BC 107 A	
T2212		Transistor	GT/2 N 3702	
T2213		Transistor	GT/2 N 3702	
T2214		Transistor	GT/BC 107 A	
T2215		Transistor	GT/2 N 3702	

		Änd.- zus.	Änd.-Mitgl. Nr.	Datum	Name	Liste Nr.	Liste besteht aus Blätt
ROHDE & SCHWARZ MÜNCHEN						414222 - 20 Sa	Blatt Nr. 4
1 CDB	Datum	Name					
geschrieben	13.9.67	Volk					Erste für Liste
bearbeitet		Volk					530282611 Schaltteilleiste zu
geprüft		BC					Regelverstärker (Gruppe)
normgeprüft							

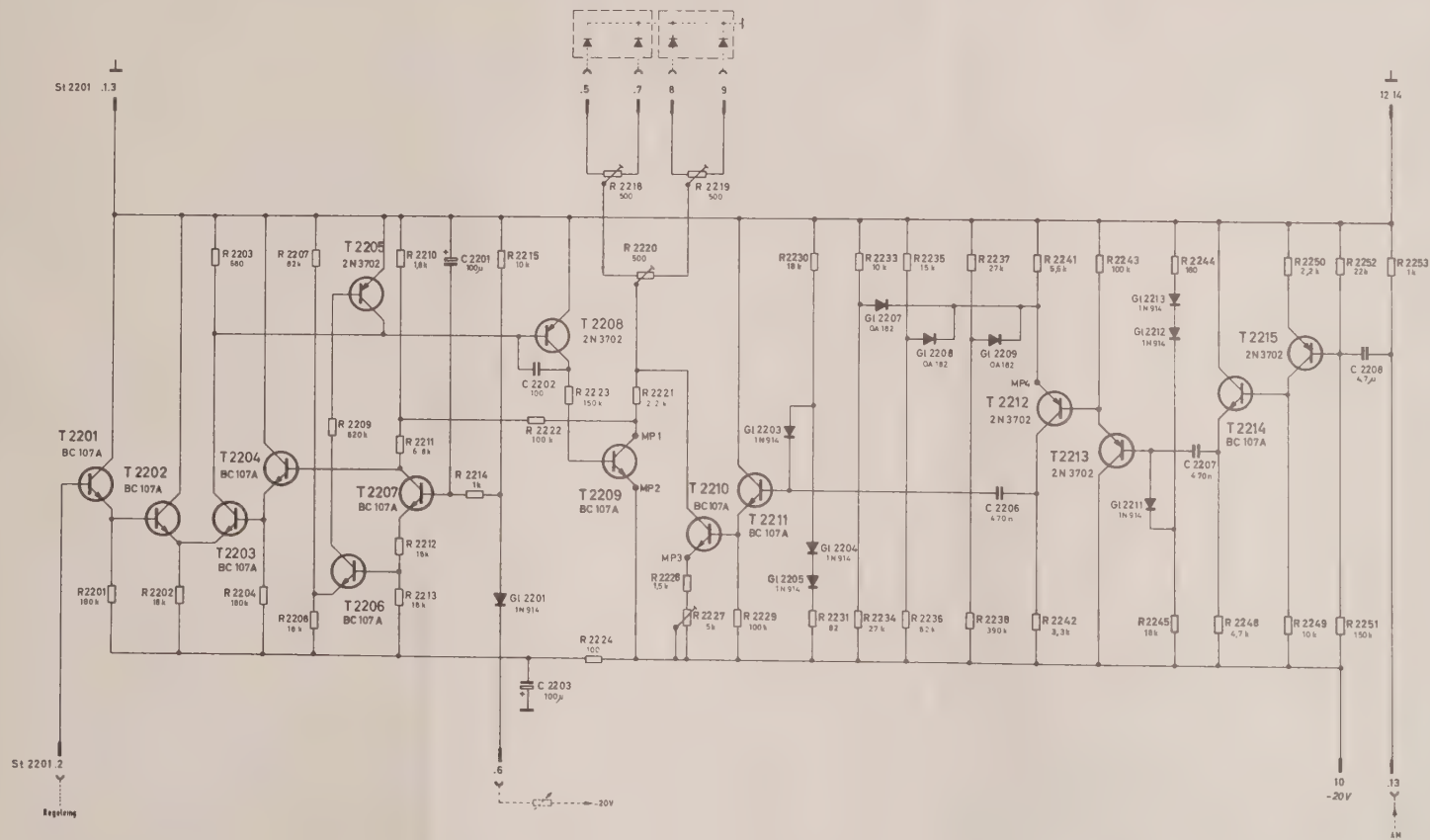
TCDE	Tag	Name	Ans. Nr.	Tag	Name	Ans. Nr.	Tag	Name	Ans. Nr.
1	15 9 67	NZ							
2		bachschaff							
3		bachschaff							
4		peralt							
5		peralt							
6		peralt							
7		peralt							
8		peralt							
9		peralt							
10		peralt							
11		peralt							
12		peralt							
13		peralt							
14		peralt							
15		peralt							
16		peralt							
17		peralt							
18		peralt							
19		peralt							
20		peralt							
21		peralt							
22		peralt							
23		peralt							
24		peralt							
25		peralt							
26		peralt							
27		peralt							
28		peralt							
29		peralt							
30		peralt							
31		peralt							
32		peralt							
33		peralt							
34		peralt							
35		peralt							
36		peralt							
37		peralt							
38		peralt							
39		peralt							
40		peralt							
41		peralt							
42		peralt							
43		peralt							
44		peralt							
45		peralt							
46		peralt							
47		peralt							
48		peralt							
49		peralt							
50		peralt							
51		peralt							
52		peralt							
53		peralt							
54		peralt							
55		peralt							
56		peralt							
57		peralt							
58		peralt							
59		peralt							
60		peralt							
61		peralt							
62		peralt							
63		peralt							
64		peralt							
65		peralt							
66		peralt							
67		peralt							
68		peralt							
69		peralt							
70		peralt							
71		peralt							
72		peralt							
73		peralt							
74		peralt							
75		peralt							
76		peralt							
77		peralt							
78		peralt							
79		peralt							
80		peralt							
81		peralt							
82		peralt							
83		peralt							
84		peralt							
85		peralt							
86		peralt							
87		peralt							
88		peralt							
89		peralt							
90		peralt							
91		peralt							
92		peralt							
93		peralt							
94		peralt							
95		peralt							
96		peralt							
97		peralt							
98		peralt							
99		peralt							
100		peralt							

Diese Zeichnung ist unser Eigentum. Vervielfältigung, auszugsweise oder gänzlich, ist ohne unsere schriftliche Genehmigung strafbar und untersagt.

ROHDE & SCHWARZ · MÜNCHEN

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig

ROHDE & SCHWARZ · MÜNCHEN

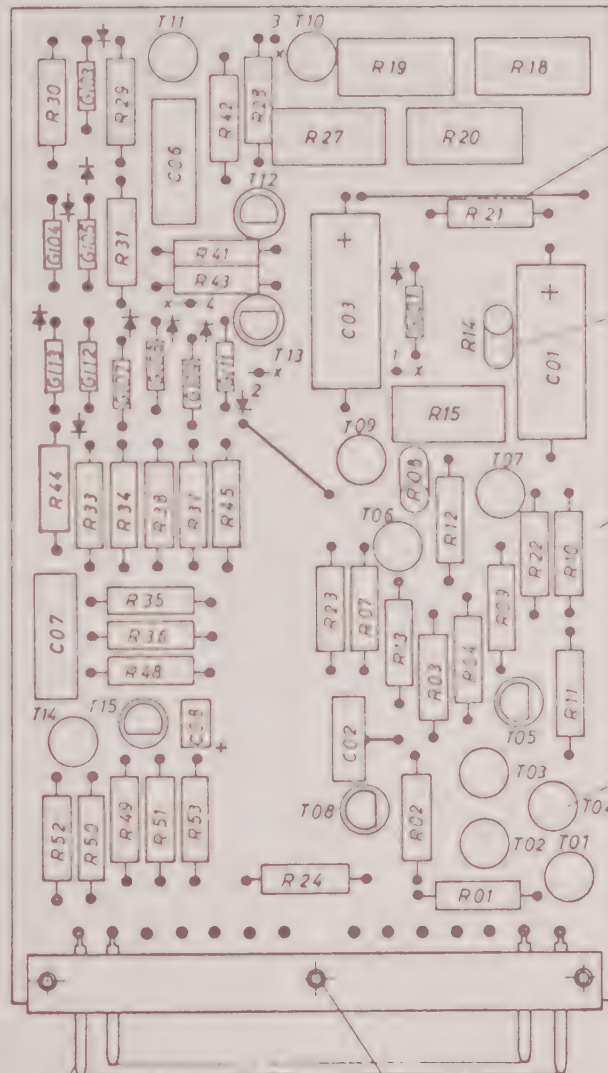


Stromlauf zu

 Regelverstärker (Gr.)

hierzu Schalteilliste 414222-20 Sa

Zeichn. Nr.
414222 - 20 S



LD 208

ZBT 70011
(2 Stück)

- 20.1

GZT 20283
(15 Stück)



FUL 51410 (St 01)

ZH 1,5x7 (3 Stück)

x KLL 30304 (4 Stück) → Schlitzrichtung der Lötöse

Den Positionsnummern Zahl 22 vorsetzen

Kollektor von T05, T08, T12, T13 und T15 abgewinkelt

hierzu 414222-20 S

414222-20 St



Projektion,
siehe E

Proj. Nr.
Pausen
Nr.

Wartungspause Nr.

ROHDE & SCHWARZ
MÜNCHEN

Halbzeug, Werkstoff

Untolerierte Maße

Zeichn. Nr.

414222-20

Maßstab

1:1

1CDD	Datum	Name	Änd. Nr.	Änd. Mittlg. Nr.	Datum	Name
gezeichnet	13.10.67	Wm	a	14216	2.1.69	Gz
bearbeitet						
geprüft						
normgepr.						

Regelverstärker (Gr.)

Translations for Code List of R&S Stock-Nos.

Abgreifbarer Drahtwiderstand	Tapped wire-wound resistor
Abkürzungserläuterung	Abbreviation
Abmessungen	Dimensions
Abmessungen/Raster	Dimensions/resolution
Abmessungsvariation	Dimensional variant
Art	Form
Ausführung	Model
Ausführung dicht	Sealed version
Bauform	Model
Bauformvariation	Model
bei	At
bei CGU an 3. Stelle a	At the 3rd place for CGU
bei Widerständen $< 5 \Omega$ und Nennlast 2 ... 50 W	With resistor $< 5 \Omega$ and nominal power 2 to 50 W
Bel. W	Pow. W
Bemerkungen	Remarks
Benennung	Designation
... bis ...	... to ...
Blechflansch	Sheet metal flange
Buchstabengruppe	Letter group
B-Wert	B value
C-Toleranz in $\pm \%$	C tolerance in $\pm \%$
desgleichen Nennlast ... W	As above, nom. power ... W

Translations for Code List (cont'd)

Df-Kondensator	Feed-through capacitor
dicht gelötet	Sealed
Dielektrikum und Belag	Dielectric and coating
Doppel; Dreifach; Vierfach-Tandem mit Schalter, offen, einlötfar	Double, triple, fourfold tandem with switch, open solderable
Doppelwulst mit Sonderarmatur	Double bead with special armature material
Drahtdrehwiderstand	Variable wire-wound resistor
Drahtnetzwerk	Resistor, wire-gauze
Drahtwiderstand	Resistor, wire-wound
Drahtwiderstand nach DIN 41411... DIN 41423 bei Nennl. 0,5 u. 1 W $\geq 5 \Omega$ und Nennlast 2 ... 50 W	Wire-wound resistor according to DIN 41411 to DIN 41423 with nom. power 0,5 and 1 W $\geq 5 \Omega$ and nom. power 2 to 50 W
dto.	Dto.
Durchführungskondensator mit M 5 x 0,5 Gewindetülle und Draht- anschlüssen	Feed-through capacitor with M 5 x 0,5 threaded sleeve and wires
DW-Kondensator	Double-beaded capacitor
Elektrolytkondensator	Electrolytic capacitor
Exponent	Exponent
Fabrikat	Made by ...
für erhöhte Anforderung	For increased requirements
für gedruckte Schaltungen	For printed circuits
für Normalverdrahtung	For conventional wiring
für normale Anforderung	For normal requirements

Translations for Code List (cont'd)

Fußflansch	Foot flange
geschlitzt	Slotted
Gewinde	Thread
Glasierter Drahtwiderstand	Glazed wire-wound
Glimmerkondensator	Mica capacitor
Größe	Size
Größe $\varnothing$ x Länge in mm	Size dia. x length in mm
HDK-Keramik	HDC ceramic
HDK-Masse	HDC material
Heißleiter	Thermistor
Heißleiter direkt geheizt	Thermistor, directly heated
Heißleiter indirekt geheizt	Thermistor, indirectly heated
Heizgitter	Heating grill
Hochohm	High resistance
Jahre-Mica-Arkt, Kunstharz vergossen TK-5 bis $30 \times 10^{-6}/^{\circ}\text{C}$	Jahre-Mica Arkt cast into synthetic resin, TC $5-30 \times 10^{-6}/^{\circ}\text{C}$
Jahre-Mica-Dur, mit Kunststoff umhüllt	Jahre-Mica-Dur covered with plastic
Jahre-Mica-Strat, Kunstharz vergossen, TK $\pm 100 \times 10^{-6}/^{\circ}\text{C}$	Jahre-Mica-Strat, cast into synthetic resin, TC $\pm 100 \times 10^{-6}/^{\circ}\text{C}$
Kapazität	Capacitance
Kap. in μF o. pF	C_{in} μF or pF
Kapazität in nF	Capacitance in nF
Kapazität in pF	Capacitance in pF
Kap. pF	Cap. pF
Kennziffer für Art, Ausführung u. Lackierg.	Code figure for form, model and finish

Kennziffer für Bauform und evtl. Widerstandswert	Code figure for form and perhaps resistance for printed circuits for conventional wiring
Kennziffer für Bauform und Dämpfung	Code figure for form and attenuation
Kennziffer für Lieferung und Ausführung	Code figure for supplier and model
Kennziffer für Lieferant und Bauform	Code figure for supplier and model
Keram. Bypasskondensator	Ceram. bypass capacitor
Keram. Df-Kondensator	Ceramic feed-through capacitor
Keram. Durchführungskondensator mit Gewindetülle und Löt-fahnen	Ceram. feed-through capacitor with threaded sleeve and soldering lugs
Keramik	Ceramic
Keramikflansch	Ceramic flange
Keramikkondensator	Ceramic capacitor
Keram. Rohrkondensator mit axialen Löt-fahnen	Ceram. tubular capacitor with axial soldering lugs
Keram. Rohrkondensator mit radialen Drahtanschlüssen, U = 500 V -	Ceramic tubular capacitor with radial wires E = 500 V DC
Keram. Scheibenkondensator ohne Anschlußdrähte, lötbar	Ceram. disc-type capacitor, without wires solderable
Keram. Scheibenkondensator mit parallelen Drahtanschlüssen, U 500 V -	Ceram. disc-type capacitor with parallel wires E 500 V DC
Keram. Waffelkondensator mit parallelen Drahtanschlüssen	Ceram. disc-type capacitor with parallel wires
Kf-Kondensator	Synthetic-foil capacitor
Kohleschichtwiderstand Abmessungen nach DIN 41404 ... DIN 41408	Deposited-carbon resistor, dimensions according to DIN 41404 to DIN 41408

Translations for Code List (cont'd)

Kohleschichtwiderstände mit radialen Drahtenden bzw. Schellen	Depos. -carbon resistor with radial wires or clamps
Kohleschichtwiderstand, tropenfest	Depos. resistor, tropicalized
Kohleschichtwiderstand unbekappt mit metallisierten Enden	Depos. carbon resistor without caps, with metallized ends
Kondensatoren	Capacitors
KT-Kondensator	Synthetic-foil capacitor
Kunstfolienkondensator	Synth. foil capacitor
Kurve und Nennlast	Characteristic nom. power
Lackdielektrikum	Lacquer dielectric
Lackkondensator	Lacquer type capacitor
Länge = 23 mm	Length 23 mm
Last	Power
linearer Widerstandsverlauf	Linear resistance characteristics
mehrlagige Lackschicht metallisiert (Fabrikat Siemens)	Multi-layer lacquer film, metallized (made by Siemens)
Miniatur	Miniature
mit geschlitzter Achse	With slotted shaft
Mittelflanşch	Middle flange
12 mm lang, geschlitzt	12 mm long, slotted
32 mm lang, glatt	32 mm long, smooth
MP-Kondensator im Rechteckbecher	MP capacitor in rectangular can
MP-Kondensator im Rundbecher	MP capacitor in round can
MP-Kondensator	MP capacitor

Translations for Code List (cont'd)

MP-Motorkondensator	MP motor capacitor
MP-Motorkondensator im Rundbecher	MP motor capacitor in round can
Nennlast	Nom. power
noch	Cont'd.
Oberfläche lackiert	Lacquer finish
ohne Welle (Schlitz > 2.5 x 0.7)	Without shaft (slot > 2.5 x 0.7)
Papier-Bypass-Kondensator im Metallrohr, dicht gelötet	Paper bypass capacitor sealed in metal tube
Papier-Durchführungs-Kondensator	Paper feed through capacitor
Papierkondensator	Paper capacitor
Papierkondensator im Keramikrohr, dicht gelötet	Paper capacitor in ceramic tube, sealed
Papierkondensator im Keramikrohr, dicht gelötet, Lötflansen	Paper capacitor in ceramic tube, sealed, soldering lugs
Papierkondensator im Metallrohr, dicht gelötet	Paper capacitor in metal tube, sealed
Papierkondensator, imprägniert und kunststoffumgossen	Paper capacitor impregnated and cast into synthetic material
Plattenkondensator	Plate capacitor
Polyester-Folie und Metall-Folie (für gedruckte Schaltg.)	Polyester foil and metal foil (for printed circuits)
Polykarbonat-Folie, metallisiert	Polyester foil, metallized
Polystrol-Folie und Metall-Folie	Polystyrene foil and metal foil
Polystrol-Kond. mit Al-Folie als Belag,	Polysterene capacitor with AL-foil coating,

Translations for Code List (cont'd)

Präzisions-Drahtwiderstand	Precision wire-wound resistor
Präzisions-Drahtwiderstand Kunstharz umgossen, Nenn- last 0,125 W	Precision wire-wound resistor, cast into synthetic resin, nom. power 0.125 W
Ringkondensator	Ring capacitor
Rohrkondensator mit Lötflächen	Tubular capacitor with soldering lugs
Rohr mit axialen Drahtanschlüssen	Tube with axial wires
Rollkondensator, axiale Anschlüsse	Roll-type capacitor, axial connections
R&S-Kondensator (Eigenfertigung)	Capacitors, made by R&S
R&S-Sachnummern, gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander	R&S Stock-Nos., equivalent figures or letters are written one below the other in this list
Rundbecher mit Befestigungswinde M 18 x 1,5 und einseitigen An- schlüssen	Round can with thread M 18 x 1.5 and connection at one side
Rundbecher mit einseitigen Löt- flächen	Round can with soldering lugs at one side
Sachnummernsystem. Jedes Feld symbolisiert einen Buchstaben oder eine Zahl	System of Stock-No. Each field stands for a letter or figure.
Sofern Bauelemente, deren Klar- text aus dieser Liste ersichtlich sind, z. B. als Reparaturteile, beschafft werden sollen und so- fern diese Beschaffung nicht über R&S erfolgt, wird empfohlen, neben den elektrischen Eigen- schaften auch die mechanischen Abmessungen anzugeben, die von dem defekt gewordenen Bauelement zu entnehmen sind.	When such components as are identified by this list are procured, say, as repair parts, from supplier other than R&S, it is recommended that the mechanical dimensions be specified in addition to the electrical values.
Sonderschichtdrehwiderstände	Special variable deposited carbon resistors of various forms
verschiedene Bauform	Diverse models
sonstige Merkmale	Other features

Translations for Code List (cont'd)

Spannung bei . . .	Voltage at . . .
Spannungsabhängiger Widerstand	Voltage-dependent resistor
Standard	Standard
Scheibenkondensator mit pilzförmiger Armatur	Disc-type capacitor with mushroom-shaped armature
Schichtdrehwiderstand	Variable deposited-carbon resistor
Schichtwiderstand	Deposited-carbon resistor
Schichtwiderstand (fest mit axialen Anschlüssen)	Depos. -carbon resistor (fixed with axial connections)
Schichtwiderstand Standardausführung für gedruckte Schaltung	Standard model for printed circuits
Schlüsselliste für R&S-Sachnummer	Code list for R&S-Stock No.
Styroflex-Kondensator	Styroflex capacitor
Styroflex-Kondensator, axiale Drahtanschlüsse Fabrikat Siemens	Styroflex capacitor axial wires, made by Siemens
T 2% = Normaltoleranz z. B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S-Sachnummer	T 2% = normal tolerance, e. g. 2% not specified in the R&S Stock-No.
Tantalelko	Tantalum electrolytic capacitor
Tantalelko, Sinterelektrode, trocken, axiale Drahtanschlüsse	Tantalum solid electrolytic capacitor, self-baking electrode, axial wires
$TK \cdot 10^{-6}/^{\circ}C$	$TC \times 10^{-6}/^{\circ}C$
TK-Reihe bzw. HDK-Masse/Klasse	TC series or HDC material/category
TK-Reihe/Klasse	TC series/category
Toleranz in % oder pF (entfällt bei Normaltoleranz $\pm 10\%$ oder ± 1 pF)	Tolerance in % or pF (omitted for normal tolerance of $\pm 10\%$ or ± 1 pF)

Translations for Code List (cont'd)

Tol. %
Tol. in %

Tolerance in %

Topfkondensator

Pot-shaped capacitor

Trapezscheibe versilbert

Trapezoidal disc, silver-plated

U
500 V = Nennspannung z. B. 500
= die Angabe der Nenn-
spannung entfällt in die-
sen Fällen in der R&S-
Sachnummer

E
500 V = nominal voltage, e. g. 500 V
DC; not specified in the R&S
Stock-No.

U_{Nenn}

E_{nom}

U_{Nenn} V-

E_{nom} V DC

U_{Nenn} in V o. kV

E_{nom} in V or kV

$U_{\text{Prüf}}$ 1200 V-

E_{test} 1200 V DC

V~

V AC

V-

V DC

Varistor

Varistor

Verklatschungskondensator

Bypass capacitor

versilberter Keramikring für
Durchführungen

Silver plated ceramic ring for
flushings

Wellenausführung

Shaft

Wellenende < 2 mm, geschlitzt

Shaft end < 2 mm, slotted

Wendel-Potentiometer

Helical potentiometer

Werkstoff KER ...

Material: KER ...

Wid. Ω

Res. Ω

Widerstandstolerance

Resistance tolerance

Widerstandswert

Resistance

Translations for Code List (cont'd)

wie CMM

Same as CMM

Widerstandsverlauf linear

Linear resistance characteristic

Zahl oder Buchstabe erscheint
immer, wenn schraffiert; nicht
immer, wenn gestricheltShaded field: letter or figure always
present; dashed field: not always present

Zahlen od. Buchstabe

Figures or letters

Zementierter Drahtdrehwider-
stand

Cemented variable wire-wound resistor

Schlüsselliste für R&S-Sachnummern

Sofern Bauelemente, deren Klartext aus dieser Liste ersichtlich sind, z.B. als Reparaturteile, beschafft werden sollen und sofern diese Beschaffung nicht über R&S erfolgt, wird empfohlen, neben den elektrischen Eigenschaften auch die mechanischen Abmessungen anzugeben, die von dem defekt gewordenen Bauelement zu entnehmen sind.

Sachnummernsystem.		Kondensatoren			Abkürzungserläuterung
Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.		Buchstaben-Gruppe Zahlen od. Buchstabe Kap. in μF o. pF Tol. in % U_{Nenn} in V o. kV sonstige Merkmale			T 2 % U 500 V
Zahl oder Buchstabe erscheint immer, wenn schraffiert, nicht immer, wenn gestrichelt					= Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S-Sachnummer. = Nennspannung z.B. 500= die Angabe der Nennspannung entfällt in diesen Fällen in der R&S-Sachnummer.
Buchstaben-Gruppe	Benennung	gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.			Bemerkungen
CBR	Keram. Bypass-kondensator	CBR 1 /	Kap.pF		T +50 % -20 % U Nenn 350 V- Fabrikat Siemens
CCB	Ringkondensator	CCB 92 /	Kap.pF	<1000pF = U 1,6 kV >1000pF = U 1 kV	versilberter Keramikring für Durchführungen
CCE	Keramikkondensator	CCE 94 /	Kap.pF		T +100 % -20 % U Nenn 500 V- Trapezscheibe versilbert
CCF	Plattenkondensator	CCF	Kap.pF / Tol. / Sp.kV		E 80 Werkstoff KER 310
CCG	Keramikkondensator	CCG Keram. Scheiben-kondensator mit parallelen Drahtanschlüssen, U 500 V-			
		TK-Reihe bzw. HDK-Masse/Klasse 11 = P 100/IB 41 = N 33/IB 55 = N 150/IB 68 = N 750/IB 75 = N1500/IB 91 = E2000/II 94 = E4000/II 96 = E6000			
		Kapazität in pF			
		C-Toleranz in $\pm$ %			

Sachnummernsystem.

Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint

immer, wenn schraffiert,

nicht immer, wenn gestrichelt

Kondensatoren

Buchstaben-Gruppe	Zahlen	Kap. in μF o. pF	Tol. in %	U _{Nenn} in V o. kV	sonstige Merkmale
					

Abkürzungserläuterung

T
2 %

= Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S-Sachnummer.

U
500V

= Nennspannung z.B. 500= die Angabe der Nennspannung entfällt in diesen Fällen in der R&S-Sachnummer.

Buchstaben-Gruppe

Benennung

R&S-Sachnummern

gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.

Bemerkungen

noch

CCG Keramik-kondensator

CCG

Keram.
Waffelkondensator
mit parallelen Draht-
anschlüssen

U_{Nenn}

40 = 30 V-
50 = 100 V-
52 = 125 V-

HDK-Masse

96 = € 6000
98 = € 10000

C-Toleranz

0 = $\pm$ 100 bis - 20 %

Kapazität in nF

CCH Keramik-kondensator

CCH

Keram.
Rohrkondensator
mit radialen Draht-
anschlüssen, U = 500 V-

Tk-Reihe/Klasse

11 = P 100/IB
12 = P 100/IA
31 = NP 0/IB
32 = NP 0/IA
42 = N 33/IC
48 = N 75/IB
49 = N 75/IA
56 = N 150/IA
59 = N 220/IA
62 = N 330/IA
65 = N 470/IA
68 = N 750/IB
69 = N 750/IA

Kapazität in pF

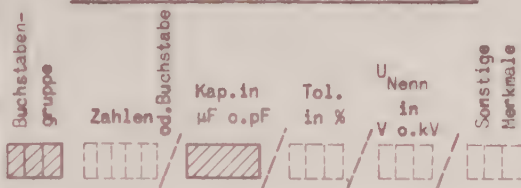
C-Toleranz
in $\pm$ %

Sachnummernsystem.

Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint immer, wenn schraffiert, nicht immer, wenn gestrichelt

Kondensatoren



Abkürzungserläuterung

T
2 %

= Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S Sachnummer.

U
500V

= Nennspannung z.B. 500= die Angabe der Nennspannung entfällt in diesen Fällen in der R&S-Sachnummer.

Buchstaben-gruppe

Benennung

R&S-Sachnummern

gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.

Bemerkungen

CCJ Keramik-kondensator

CCJ

Keram.
Scheibenkondensator
ohne Anschlußdrähte,
lötbar

U Nenn
64 = 500 V-

Tk-Reihe bzw.
HDK-Masse/Klasse

11 = P 100/IB
31 = NP 0/IB
55 = N 150/IB
94 = E 4000

C-Toleranz

2 = $\pm$ 50 bis - 20 %
6 = $\pm$ 2,5 %
9 = $\pm$ 1 pF

Kapazität in pF

CCK Keramik-Kondensator

CCK

Keram.
Rohrkondensator
mit axialen
Lötfahnen

Tk-Reihe/Klasse

11 = P 100/IB
41 = N 33/IB
68 = N 750/IB

Kapazität in pF

C-Toleranz
in $\pm$ %

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und Schadensersatzpflichtig.

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

Sachnummernsystem. Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.		<u>K o n d e n s a t o r e n</u>					Abkürzungserläuterung		
Zahl oder Buchstabe erscheint immer, wenn schraffiert, nicht immer, wenn gestrichelt		Buchstaben- gruppe	Zahlen od. Buchstabe	Kap. in µF o. pF	Tol. in %	U Nenn in V o. kV	Sonstige Merkmale	T 2 %	- Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S- Sachnummer.
Buch- staben- gruppe		R&S-Sachnummern gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.					U 500V - Nennspannung z.B. 500- die Angabe der Nennspannung entfällt in diesen Fällen in der R&S-Sachnummer.		
Benennung		Bemerkungen							
noch CCK	Keramik- kondensator		CCK				P . . .		
		Keram. _____ Rohrkondensator mit radialen Draht- anschlüssen U Nenn _____ 67 = 700 V- Tk-Reihe/Klasse _____ 11 = P 100/IB 31 = NP 0/IB 55 = N 150/IB 68 = N 750/IB C-Toleranz _____ 6 = ± 2,5 % Kapazität in pF _____							
CCL	Keramik- kondensator					U Nenn V -	TK-Reihe/ Klasse	T %	
		CCL 11 / Kap. pF / Tol. %				700	P 100/IB	±10	Rohrkondensator mit Lötfahnen
		CCL 55 / Kap. pF / Tol. %					N 150/IB		
		CCL 68 / Kap. pF / Tol. %					N 750/IB		
CCW	Topfkonden- sator	CCW	Kap. pF	/	Tol. %	/	Spg. kV	E 80 Werkstoff KER 310	

N-Mh

894

4

1987



Sachnummernsystem.

Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint

immer, wenn schraffiert,

nicht immer, wenn gestrichelt

Buchstaben-
gruppe

Benennung

Kondensatoren

Buchstaben- gruppe	Zahlen	od. Buchstabe	Kap. in μF o. pF	Tol. in %	U _{Nenn} in V o. kV	Sonstige Merkmale
						

Abkürzungserläuterung

- T**
2 %
- Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S-Sachnummer.
- U**
500V
- Nennspannung z.B. 500- die Angabe der Nennspannung entfällt in diesen Fällen in der R&S-Sachnummer.

R&S-Sachnummern

gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.

Bemerkungen

CED
CEE
CEG

Elektrolyt-
kondensator

Elektrolyt-
kondensator

Art

D - Rohr mit axialen
Drahtanschlüssen

E - Rundbecher mit
einseitigen
Lötfahnen

G - Rundbecher mit
Befestigungsgewinde
M 18 x 1,5 und ein-
seitigen Anschlüssen

Ausführung

2 -

3 -

5 -

6 -

7 -

für normale
Anforderung

21 -

22 -

für erhöhte
Anforderung

Kapazität in μF

U_{Nenn} in V

CE



..

..

..

..

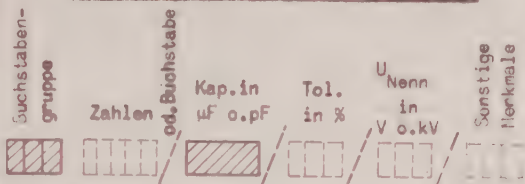
Sachnummernsystem.
Jedes Feld symbolisiert
einen Buchstaben oder eine
Zahl.

Zahl oder Buchstabe erscheint
immer, wenn schraffiert,
nicht immer, wenn gestrichelt

Buch-
staben-
gruppe

Benennung

Kondensatoren



Abkürzungserläuterung

- T**
2 % - Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S-Sachnummer.
- U**
500V - Nennspannung z.B. 500= die Angabe der Nennspannung entfällt in diesen Fällen in der R&S-Sachnummer.

R&S-Sachnummern
gleichartige Zahlen oder Buchstaben stehen
in dieser Liste untereinander.

Bemerkungen

CEU Tantalelko

CEU

Tantalelko,
Sinterelektrode, trocken,
axiale Drahtanschlüsse

- U_{Nenn}
- 26 - 6V-
 - 30 - 10V-
 - 33 - 15V-
 - 36 - 20V-
 - 41 - 35V-

- Größe ϕ x Länge in mm
- 2 - 4,2 x 8,2
 - 3 - 5,5 x 13
 - 4 - 8,1 x 18,3
 - 5 - 9,7 x 20,9

Ausführung
4 - dicht gelötet

C-Toleranz
3 - $\pm 20\%$

Kapazität in μF

CFG Df-Kondensator

CFG



R&S-Kondensator (Eigenfertigung)
 $U_{Prüf}$ 1200 V-

EN-Mh
7894
6
67



Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und Schadensersatzpflichtig.

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

Sachnummernsystem. Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.		Kondensatoren						Abkürzungserläuterung	
Zahl oder Buchstabe erscheint immer, wenn schraffiert, nicht immer, wenn gestrichelt		Buchstaben- gruppe	Zahlen	Kap. in µF o. pF	Tol. in %	U Nenn in V o. kV	Sonstige Merkmale	T 2 %	- Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S- Sachnummer.
Buch- staben- gruppe	Benennung	R&S-Sachnummern gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.						Bemerkungen	
CFM	Df-Kondensator	CFM	.	.	.	.	p n		
		Durchführungs- kondensator mit M 5 x 0,5 Gewinde- tülle und Drahtan- schlüssen U Nenn 64 = 500 V- Tk-Reihe bzw. HDK-Masse/Klasse 11 = P 100/IB 31 = NP 0/IB 55 = N 150/IB 68 = N 750/IB 75 = N 1500/IB 86 = E 700 91 = E 2000 94 = E 4000 C-Toleranz 2 = ± 50 bis - 20 % 3 = ± 20 % 4 = ± 10 % 5 = ± 5 % 6 = ± 2 % Kapazität p = pF n = nF							
CFR	Ker. Df-Kon- densator	CFR	.	.	.	.	U Nenn in V-		
		Ker. Durchführungs- kondensator mit Gewindetülle und Lötfahnen Bauform Kapazität in pF							

EN-Mh

7894

7



Sachnummernsystem.

Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint immer, wenn schraffiert, nicht immer, wenn gestrichelt.

Buchstaben-
gruppen

Benennung

Kondensatoren

Buchstaben-
gruppe Zahlen od. Buchstabe Kap. in uF o. pF Tol. in % U Nenn in V o. kV Sonstige Merkmale

Abkürzungserläuterung

T
2 %

= Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S-Sachnummer.

U
500V

= Nennspannung z.B. 500= die Angabe der Nennspannung entfällt in diesen Fällen in der R&S-Sachnummer.

R&S-Sachnummern

gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.

Bemerkungen

CFS Keramischer
DF-Kondensator

CFS

Kap.pF

CFS

Kap.pF

M5

Scheibenkondensator mit
pilzförmiger Aeraur

Gewinde M4

T
+ 50 %
- 20 %

U
Nenn
500

Gewinde M5

CGJ Glimmer-
CGT kondensator
CGU

Glimmer-
kondensator
Fabrikat Jahre

CG

Art

n

p

CGV Verklatschungs-
kondensator

J = Jahre-Mica-Arkt, kunstharz-
vergossen, TK - 5 bis
 $30 \times 10^{-6}/^{\circ}\text{C}$

T = Jahre-Mica-Strat, kunstharz-
vergossen, TK $\pm 100 \times 10^{-6}/^{\circ}\text{C}$

U = Jahre-Mica-Dur, mit Kunststoff
umhüllt

V = Verklatschungskondensator

U
Nenn

60 = 300 V-

64 = 500 V-

70 = 1000 V-

76 = 2000 V-

Ausführung, Bauform
bei CGU an 3. Stelle

TK $\cdot 10^{-6}/^{\circ}\text{C}$

0 = ± 200

1 = ± 100

2 = - 20 bis + 100

3 = - 0 bis + 70

C-Toleranz

4 = $\leq \pm 10 \%$

5 = $\leq \pm 5 \%$

6 = $\leq \pm 2,5 \%$

7 = $\leq \pm 1 \%$

8 = $\leq \pm 0,5 \%$

Kapazität

n = nF

p = pF

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und Schadensersatzpflichtig.

TEN-Mh

7894

1.8

2.2.67



Sachnummernsystem.

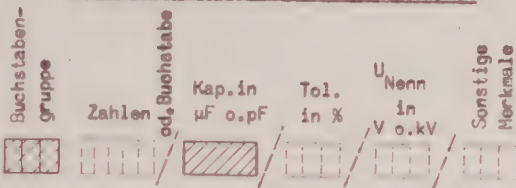
Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint

immer wenn schraffiert

nicht immer wenn gestrichelt

Kondensatoren



Abkürzungserläuterung

T
2 %

- Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S-Sachnummer.

U
500V

- Nennspannung z.B. 500= die Angabe der Nennspannung entfällt in diesen Fällen in der R&S-Sachnummer.

Buchstaben-
gruppe

Benennung

R&S-Sachnummern

gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.

Bemerkungen

CHF

Platten-
kondensator

CHF

1 / 3000 / 10

U Nenn 10 KV

3000 pF $\pm$ 60 %
- 20 %

HDK-Keramik
Fabrikat Resista

CKD

KT-Kondensa-
tor

CKD

Styroflex-
kondensator, axiale
Drahtanschlüsse
Fabrikat Siemens

Bauform

1 - B 31110 A

2 - B 31310 A

Kapazität in pF

Toleranz in % oder pF
(entfällt bei Normaltoleranz
 $\pm$ 10 % oder $\pm$ 1 pF)

U Nenn in V-

Diese Zeichnung ist Eigentum der Vertriebsgesellschaft. Vervielfältigung, Verbreitung, Weitergabe oder Nachdruck ist ohne schriftliche Genehmigung der Vertriebsgesellschaft strafbar.

TEN-Mh

7894

9

67



Sachnummernsystem.

Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint

immer, wenn schraffiert,

nicht immer wenn gestrichelt

Kondensatoren

Buchstaben- gruppe	Zahlen	Kap. in μF o. pF	Tol. in %	U Nenn in V o. kV	sonstige Merkmale

Abkürzungserläuterung

T
2 %

= Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S-Sachnummer.

U
500V

= Nennspannung z.B. 500= die Angabe der Nennspannung entfällt in diesen Fällen in der R&S-Sachnummer.

Buch-
staben-
gruppe

Benennung

R&S-Sachnummern

gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.

Bemerkungen

noch

CKD KT-Kondensator

CKE

CKF

CKG

CKK

CKL

UK

Kunstfolien-
Kondensator

Art
(Dielektrikum und Belag)

D - Polystyrol-Folie
und Metall-Folie

E - Polykarbonat-Folie
und Metall-Folie

F - Polykarbonat-Folie,
metallisiert

G - Polyester-Folie,
metallisiert

K - Polyester-Folie
und Metall-Folie
(für gedruckte Schaltg.)

L - mehrlagige Lackschicht,
metallisiert
(Fabrikat Siemens)

U
Nenn

44 = 50 V-
46 = 63 V-
50 = 100 V-
52 = 125 V-
54 = 160 V-
58 = 250 V-
62 = 400 V-
64 = 500 V-
66 = 630 V-
70 = 1000 V-

Kapazität

n = μF
n = nF
p = pF

Ausführung, Bauform

C-Toleranz

3 = ≤ 20 %
4 = ≤ 10 %
5 = ≤ 5 %
6 = $\leq 2,5$ %
7 = ≤ 1 %
8 = $\leq 0,5$ %
9 = ≤ 1 pF

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

N-Mh

894

10

197

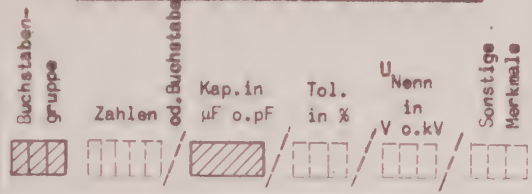


Sachnummernsystem.

Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint immer wenn schraffiert, nicht immer wenn gestrichelt

Kondensatoren



Abkürzungserläuterung

- T** 2 % = Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S Sachnummer.
- U** 500V = Nennspannung z.B. 500- die Angabe der Nennspannung entfällt in diesen Fällen in der R&S-Sachnummer.

Buchstaben-Gruppe

Benennung

R&S-Sachnummern
gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.

Bemerkungen

CKO Lackkondensator

CKO 2 / Kap.µF / Spg.V

T + 10 % Fabrikat Bosch
Lackdielektrikum

CKS Kf-Kondensator

CKS Kap.pF / Tol.% / Spg.V

T + 5 % Fabrikat Schümann
Styroflex-Kondensator

CKS . . 1 5 . $\frac{p}{n}$. .

Polystyrol-Kond. mit Al-Folie als Belag, Fabrikat Schümann

U Nenn

- 44 = 50 V -
- 52 = 125 V -
- 60 = 300 V -
- 64 = 500 V -

Bauform

Rollkondensator
axiale Anschlüsse

Ausführung
dicht

C-Toleranz

- 4 = + 10 %
- 5 = + 5 %
- 6 = + 2 %
- 7 = + 1 %
- 8 = + 0,5 %

Kapazität

p = pF
n = nF

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und Schadensersatzpflichtig.

2TEN-Mb

R 7894

Bl. 11

2.67



Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

Sachnummernsystem. Jedes Feld symbolisiert einen Buchstaben oder eine Zahl. Zahl oder Buchstabe erscheint immer, wenn schraffiert, nicht immer, wenn gestrichelt.	K o n d e n s a t o r e n Buchstaben-Gruppe Zahlen Buchstabe Kap. in μF o. pF Tol. in % U Nenn in V o. kV Sonstige Merkmale	Abkürzungserläuterung T 2 % U 500V - Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S-Sachnummer. - Nennspannung z.B. 500- die Angabe der Nennspannung entfällt in diesen Fällen in der R&S-Sachnummer.
--	--	---

Buchstaben-Gruppe	Benennung	R&S-Sachnummern gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.	Bemerkungen
-------------------	-----------	--	-------------

CMM	MP-Motor-kondensator	CMM $\leq 0,5 \mu F \pm 20 \%$ Kap. μF $> 0,5 \mu F \pm 10 \%$ Spg. V 1 CMM u . . U Nenn 54 = 160 V ~ 60 = 300 V ~ 62 = 400 V ~ 63 = 450 V ~ 64 = 500 V ~ Ausführung, Bauform C-Toleranz 4 = $\pm 10 \%$ Kapazität in μF	MP-Motor-Kondensator im Rundbecher
-----	----------------------	--	---

CMQ	MP-Kondensator	wie CMM	MP-Kondensator im Rechteckbecher
-----	----------------	---------	----------------------------------

CMR	MP-Kondensator	CMR $\leq 0,5 \mu F \pm 20 \%$ Kap. μF $> 0,5 \mu F \pm 10 \%$ Spg. V Art CMR u . . U Nenn 54 = 160 V - 61 = 350 V - 64 = 500 V - 68 = 800 V - 76 = 2 kV - Ausführung, Bauform C-Toleranz 2 = $\pm 50 \%$ 3 = $\pm 20 \%$ 4 = $\pm 10 \%$ Kapazität in μF	MP-Kondensator im Rundbecher
-----	----------------	---	-------------------------------------

2TEN-Mh
R 7894
Bl. 12
2.67



Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und Schadensersatzpflichtig

Sachnummernsystem. Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.		K o n d e n s a t o r e n						Abkürzungserläuterung		
Zahl oder Buchstabe erscheint immer, wenn schraffiert, nicht immer, wenn gestrichelt		Buchstaben- gruppe 	Zahlen 	Kap.in µF o. pF 	Tol. in % 	U _{Nenn} in V o. kV 	Sonstige Merkmale 	T 2 % U 500V - Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S- Sachnummer. - Nennspannung z.B. 500= die Angabe der Nennspannung entfällt in diesen Fällen in der R&S-Sachnummer.		
Buch- staben- gruppe	Benennung	R&S-Sachnummern gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.						Bemerkungen		
CNF	Platten- kondensator	CNF	Kap.pF	/	Tol.%	/	Spg.kV	E 6 Werkstoff KER 221		
CNW	Topf- kondensator	CNW	Kap.pF	/	Tol.%	/	Spg.kV	T ± 20 % E 6 Werkstoff KER 221		
CPD	Df-Kondensa- tor	CPD	Kap.µ	/	Spg.V	T + 30 % - 20 % Papier-Durchführungs- Kondensator *) 1 µF in µF < 1 µF in pF				
CPF	Papier- kondensator	CPF	Kap.pF	/	Spg.V	< 10.000 pF T ± 20 % > 10.000 pF T ± 10 % Papierkondensator im Metallrohr dicht gelötet				
CPK	Papier- kondensator	CPK	Papier- kondensator imprägniert und kunststoffumgossen U_{Nenn} 58 = 250 V 62 = 400 V 66 = 630 V 70 = 1 kV Ausführung, Bauform C-Toleranz 3 = ± 20 % 4 = ± 10 % Kapazität in pF							

EN-Mh
7894
13
67



Sachnummernsystem.

Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint immer, wenn schraffiert, nicht immer, wenn gestrichelt

Kondensatoren

Buchstaben- gruppe	Zahlen	Kap.in µF o. pF	Tol. in %	U Nenn in V o. kV	Sonstige Merkmale

Abkürzungserläuterung

T
2 %

= Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S-Sachnummer.

U
500V

= Nennspannung z.B. 500- die Angabe der Nennspannung entfällt in diesen Fällen in der R&S-Sachnummer.

Buch-
staben-
gruppe

Benennung

R&S-Sachnummern

gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.

Bemerkungen

CPM

Papier-
Kondensator

CPM

Kap.pF

SpgV

< 10.000 pF

T
+ 20 %

Papier-Bypass-Kondensator im Metallrohr dicht gelötet

CPR

Papier-
Kondensator

CPR

Kap.pF

Spg.V

> 10.000 pF

T
+ 10 %

Papierkondensator im Keramikrohr, dicht gelötet

CRF

Papier-
Kondensator

CRF

Kap.pF

Spg.V

Papierkondensator im Keramikrohr, dicht gelötet, Lötflächen

CXD

DW-
Kondensator

CXD 300/3

Doppelwulst mit Sonderarmatur 300 pF + 20 %, 3 kV, E40, Werkstoff KER 331

CXF

Platten-
kondensator

CXF

Kap.pF

Tol. %

Spg.kV

E 40
Werkstoff KER 331

CXT

Topf-
kondensator

CXT

Kap.pF

Tol. %

Spg.kV

B oder F

B = Blechflansch
F = Keramikflansch
E 40, Werkstoff KER 331

CXW

Topf-
kondensator

CXW

Kap.pF

Tol. %

Spg.kV

F oder M

F = Fußflansch
M = Mittelflansch

T
+ 20 %
E 40
Werkstoff KER 331

2TEN-Mh

R 7894

Bl. 14

2.67



060; 100 x 100 Dm;

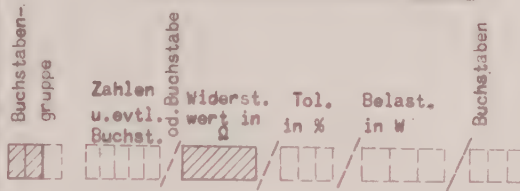
ROHDE & SCHWARZ, MÜNCHEN

Sachnummernsystem.

Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint immer, wenn schraffiert
nicht immer, wenn gestrichelt

Widerstände



Abkürzungserläuterung

T
2 %

= Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S-Sachnummer.

Buchstaben-Gruppe

Benennung

R&S-Sachnummern

gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.

Bemerkungen

WD Drahtwiderstand

WD $\frac{\boxed{\text{Wid.}\Omega}}{\boxed{\text{Tol.}\%}} \frac{\boxed{\text{Bel.}\text{W}}}{\boxed{\text{Bel.}\text{W}}}$

T
+ 5 %

Drahtwiderstand nach DIN 41411...DIN 41423 bei Nennl. 0,5 u. 1 W $\geq 5 \Omega$ und Nennlast 2...50 W

WD $\frac{\boxed{\text{Wid.}\Omega}}{\boxed{\text{Tol.}\%}} \frac{\boxed{\text{Bel.}\text{W}}}{\boxed{\text{Bel.}\text{W}}}$

T
+10 %

bei Widerständen $< 5 \Omega$ und Nennlast 2...50 W

Abmessungsvariation

WDF Drahtwiderstand

WDF 21 $\frac{\boxed{\text{Wid.}\Omega}}{\boxed{\text{Tol.}\%}} \frac{\boxed{\text{Bel.}\text{W}}}{\boxed{\text{Bel.}\text{W}}}$

Präz.-Drahtwiderstand

Bauform
Fabr. Resista Rdm

Nennlast
2 = 0,5 W
3 = 1,0 W

Widerstandstoleranz
± 0,62%

Widerstandswert
M = MΩ
k = kΩ
E = Ω

Fabr. Resista
Präzisions-Drahtwiderstand
Kunstharz umgossen
Nennlast 0,125 W

WDF 31 $\frac{\boxed{\text{Wid.}\Omega}}{\boxed{\text{Tol.}\%}} \frac{\boxed{\text{Bel.}\text{W}}}{\boxed{\text{Bel.}\text{W}}}$

desgleichen Nennlast 0,25 W

WDF 41 $\frac{\boxed{\text{Wid.}\Omega}}{\boxed{\text{Tol.}\%}} \frac{\boxed{\text{Bel.}\text{W}}}{\boxed{\text{Bel.}\text{W}}}$

desgleichen Nennlast 0,33 W

WDF 51 $\frac{\boxed{\text{Wid.}\Omega}}{\boxed{\text{Tol.}\%}} \frac{\boxed{\text{Bel.}\text{W}}}{\boxed{\text{Bel.}\text{W}}}$

desgleichen Nennlast 0,5 W
Länge = 23 mm

WDF 61 $\frac{\boxed{\text{Wid.}\Omega}}{\boxed{\text{Tol.}\%}} \frac{\boxed{\text{Bel.}\text{W}}}{\boxed{\text{Bel.}\text{W}}}$

desgleichen Nennlast 0,5 W
Länge = 33 mm

WDF 71 $\frac{\boxed{\text{Wid.}\Omega}}{\boxed{\text{Tol.}\%}} \frac{\boxed{\text{Bel.}\text{W}}}{\boxed{\text{Bel.}\text{W}}}$

desgleichen Nennlast 1 W

WDG Drahtwiderstand

WDG $\frac{\boxed{\text{Wid.}\Omega}}{\boxed{\text{Tol.}\%}} \frac{\boxed{\text{Bel.}\text{W}}}{\boxed{\text{Bel.}\text{W}}}$

T
+10 %

Glasierter Drahtwiderstand

WDN Drahtnetz-widerstand

WDN $\frac{\boxed{\text{Wid.}\Omega}}{\boxed{\text{Bel.}\text{W}}}$

Heizgitter

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und Schadensersatzpflichtig.

W-Mh

894

15

2.67



Sachnummernsystem.

Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint immer, wenn schraffiert
nicht immer, wenn gestrichelt

Widerstände

Buchstaben- gruppe	Zahlen u. evtl. Buchst.	Widerst. wert in Ω	Tol. in %	Belast. in W	Buchstaben

Abkürzungserläuterung

T
2 %

= Normaltoleranz z.B. 2% die Angabe der Toleranz entfällt in diesen Fällen in der R&S-Sachnummer.

Buchstaben-
gruppe

Benennung

R&S-Sachnummern

gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.

Bemerkungen

WFG

Schicht-
widerstand

WFG

/ /

T
±5%

Kohleschichtwiderstand, Abmessungen nach DIN 41404...DIN 41408

WFE

Schicht-
widerstand

WFE

WFE

H
k
E

Schichtwider-
stand (fest)
mit axialen
Anschlüssen

Art,
Nennlast
2 = Miniatur 0,3W
3 = Standard 0,5W
5 = Last 1,0W
6 = Hochohm 1,5W

Widerstandstoleranz
2 = + 5 %
3 = + 2 %
4 = + 1 %
5 = + 0,5 %
6 = + 0,2 %

Ausführung
1 = Oberfläche lackiert

Widerstandswert
M = MΩ
k = kΩ
E = Ω

WFG

Schicht-
widerstand

WFG

WFG 21

k
E

Schicht-
widerstand
Standausführung
für gedruckte
Schaltung,
Nennlast 0,125W

Abmessungen/
Raster
5x5x15 / 2,5

Widerstandstoleranz
2 = + 5 %
3 = + 2 %
4 = + 1 %

Widerstandswert
k = kΩ
E = Ω

WFK

Schicht-
widerstand

WFK

/ /

T
±5%

Fabr. Resista Kohleschichtwiderstand unbekappt mit metallisierten Enden

Kennziffer für Art, Ausführung u. Lackierg.

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

N-Mh

894

16

257



Sachnummernsystem.

Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint immer, wenn schraffiert
nicht immer, wenn gestrichelt

Widerstände

Buchstaben- gruppe	Zahlen u. evtl. Buchst.	Widerst. wert in Ω	Tol. in %	Belast. in W	Buchstaben

Abkürzungserläuterung

T
2 %

= Normaltoleranz z.B. 2%
die Angabe der Toleranz
entfällt in diesen
Fällen in der R&S-Sach-
nummer.

Buch-
staben-
gruppe

Benennung

R&S-Sachnummern

gleichartige Zahlen oder Buchstaben stehen in
dieser Liste untereinander.

Bemerkungen

WFS

Schicht-
widerstand

WFS

/ / /

Kennziffer für Liefe-
rung und Ausführung

T
+5%

Fabr. Resista
Kohleschichtwiderstände
mit radialen Drahtenden
bzw. Schellen

WFS

6

-

2

M
k
E

Kohleschicht-
widerstand,
tropfenfest,
Nennlast 1 W

Abmessungen
62 x 10

Widerstandstoleranz

2 = + 5%

3 = + 2%

4 = + 1%

Ausführung

Widerstandswert

M = MW

k = kΩ

E = Ω

WH

Heißeleiter

WHD

/ /

T
+20 %

Heißeleiter direkt geheizt

Kennziffer für Liefe-
rung und Bauform

WHN

/ /

T
+20 %

Heißeleiter indirekt
geheizt

Kennziffer Lieferant
und Bauform

WR

Drahtdreh-
widerstand

Fabr. RIG

Zementierter Drahtdrehwiderstand

Nennlast

Wellenausführung

WR 1

/

1

-

WR 1F

/

1

geschlitz

WR 4

/

4

-

WR 4F

/

4

geschlitz

WR 10

/

10

-

WR 10 F

/

10

geschlitz

WR 20

/

20

-

WR 20 F

/

20

geschlitz

WR 40

/

40

-

WR 40 F

/

40

geschlitz

WR 100

/

100

-

WR 250

/

250

-

Sachnummernsystem.

Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint immer, wenn schraffiert
nicht immer, wenn gestrichelt

Buchstaben-
staben-
gruppe

Benennung

Widerstände

Buchstaben-
gruppe

Zahlen
u. evtl.
Buchst.
Buchstabe

Widerst.
wert in
in %

Tol.
in %

Belast.
in W

Buchstaben

Abkürzungserläuterung

T
2 %

• Normaltoleranz z.B. 2%
die Angabe der Toleranz
entfällt in diesen
Fällen in der R&S-Sach-
nummer.

R&S-Sachnummern
gleichartige Zahlen oder Buchstaben stehen in
dieser Liste untereinander.

Bemerkungen

WRG Draht-Dreh-
widerstand

WRG / Wid.Ω

WRG . . 0 . 3 k . .

Bauform
Nennlast 1 W

linearer
Widerstandsverlauf

Ausführung
0-für Normalverdrahtung
1-für gedruckte Schaltungen

Wellenende
< 2 mm, geschlitzt

Widerstandswert
k = kΩ
E = Ω

Kennziffer für Liefe-
rant und Ausführung

Nennlast WRG 2 = 1 W
WRG 3 = 0,5 W

WRW Wendel-
Potentiometer

WRW / Wid.Ω

WRW 50134 k . .

Abmessungen,
Bauform,
Linearitäts-
toleranz +0,25%

Widerstands-
toleranz + 3 %
Nennlast 1,5 W

Widerstandswert in kΩ

Kennziffer für Liefe-
rant und Ausführung

Nennlast WRW 2 = 2 W
WRW 22 = 5 W

WS Schichtdreh-
widerstand

WS 5122 F / Wid.Ω

WS 5126 / Wid.Ω

WS 5226 / Wid.Ω

WS 5326 / Wid.Ω

WS 6126 / Wid.Ω

Kurve u.
Nennlast

lin. log.
W W

Wellenausführung

0,8	-	1 - 12 mm geschlitzt
0,8	-	1 - 32 mm
-	0,4	1 - 32 mm
-	0,4	1 - 32 mm
2	-	1 - 32 mm

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und Schadensersatzpflichtig

Sachnummernsystem.

Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint immer, wenn schraffiert
nicht immer, wenn gestrichelt

Widerstände

Buchstaben- gruppe	Zahlen u. evtl. Buchst.	Widerst. wert in Ω	Tol. in %	Belast. in W	Buchstaben

Abkürzungserläuterung

T
2 %

- Normaltoleranz z.B. 2%
die Angabe der Toleranz
entfällt in diesen
Fällen in der R&S-Sach-
nummer.

Buch-
staben-
gruppe

Benennung

R&S-Sachnummern

gleichartige Zahlen oder Buchstaben stehen in
dieser Liste untereinander.

Bemerkungen

noch

WS

Schichtdreh-
widerstand

Kurve und
Nennlast

Wellenausführung

lin.
W log.
W

WS 7122 F / Wid.Ω

0,4

-

1 - 12 mm
geschlitzt

WS 7126 / Wid.Ω

0,4

-

1 - 32 mm

WS 7222 F / Wid.Ω

-

0,2

1 - 12 mm
geschlitzt

WS 7226 / Wid.Ω

-

0,2

1 - 32 mm

WS 7326 / Wid.Ω

-

0,2

1 - 32 mm

WS 9122 F / Wid.Ω

0,2

-

1 - 12 mm
geschlitzt

WS 9126 / Wid.Ω

0,2

-

1 - 32 mm

WS 9226 / Wid.Ω

-

0,1

1 - 32 mm

WSD

Schichtdreh-
widerstand

WSD / Wid.Ω

Sonderschichtdrehwiderstände
verschiedener Bauform

(Doppel; Dreifach; Vierfach-
Tandem mit Schalter, offen,
einlötlbar)

Kennziffer für Bauform und evtl.
Widerstandswert

WSD F / Wid.Ω

dto. mit geschlitzter Achse

WSG

Schichtdreh-
widerstand

WSG . . 0 . . / Wid.Ω

Schichtdreh-
widerstand
(Keramik)

Bauform

11 = für gedruckte Schaltung
20 = für Normalverdrahtung
21 = für Normalverdrahtung
91 = für gedruckte Schaltung, Nennlast 0,2W

Nennlast
1 W

Widerstands-
verlauf linear

Ausführung

Wellenende

0 = ohne Welle (Schlitz > 2,5 x 0,7)
1 = 12 mm lang, geschlitzt
2 = 32 mm lang, glatt

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadensersatzpflichtig.

EN-Mh

894

19

7



Sachnummernsystem.

Jedes Feld symbolisiert einen Buchstaben oder eine Zahl.

Zahl oder Buchstabe erscheint immer, wenn schraffiert
nicht immer, wenn gestrichelt

Widerstände

Buchstaben- gruppe	Zahlen u. evtl. Buchst.	Widerst. wert in Ω	Tol. in %	Belast. in W	Buchstaben
					

Abkürzungserläuterung

T
2 %

= Normaltoleranz z.B. 2%
die Angabe der Toleranz entfällt in diesen Fällen in der R&S-Sachnummer.

Buchstaben-
gruppe

Benennung

R&S-Sachnummern

gleichartige Zahlen oder Buchstaben stehen in dieser Liste untereinander.

Bemerkungen

WSH

Schichtdreh-
widerstand

WSH

 / 

Kennziffer für
Bauform und Dämpfung

WUC

Varistor

WUC

Spannungs-
abhängiger
Widerstand

Größe,
Nennlast
(bei $\Delta t = 100^\circ\text{C}$)

3 = 0,5 W
4 = 1 W
5 = 2 W
6 = 3 W

B-Wert

(Spannung bei J = 1A)

03 = 15V	16 = 180V
04 = 18V	17 = 220V
05 = 22V	18 = 270V
06 = 27V	19 = 330V
07 = 33V	20 = 390V
08 = 39V	21 = 470V
09 = 47V	22 = 560V
10 = 56V	23 = 680V
11 = 68V	24 = 820V
12 = 82V	25 = 1000V
13 = 100V	26 = 1200V
14 = 120V	27 = 1500V
15 = 150V	

Exponent

3 = 0,3 = 1/3,3
4 = 0,255 = 1/4
5 = 0,215 = 1/4,6
6 = 1/6
7 = 0,175 = 1/5,7

Ausführung

Nennlast

W

WV 4 / 

4

WV 6 / 

6

WV 12 / 

12

WV 25 / 

25

WVD 50 / 

50

48 mm

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

N-Mh

WV

Abgreifbarer
Drahtwider-
stand

894

20

2.67



Zusammenstell - Vorschrift Nr R 17645

zur ~~deutschen~~ englischen Geräte Grundgeräte-Einschub-Zusatzgeräte-Baugruppen
~~Einsatz-Rahmen-Anlagen~~ - Beschreibung für

Typ SMAI

BN 414202

FNr. F 2164/1,3,4,6,8,
 9,10,12,13,
 15

F 2216/..

F 2232/..

Tektronix

Zusammenstellung nach Pos.-Nr.

Umschlag ~~Karton mit Rückenbindung~~

~~Kunststoffordner 40 mm~~

1 Kunststoffordner 60 mm

~~ohne, dafür 4-fachlochung mit Bänderole~~

Umschlagbeschriftung

~~auf 1 Seite nach Vorlage R~~

auf Rücken nach Vorlage R 17323 Bl. 0

Register ~~Nr. 4319 (1-10)~~

~~Nr. 4320 (11-20)~~

~~Nr. 4321 (21-30)~~

~~Nr. 4322 (31-40)~~

Pos.-Nr	Teil	Sach-Nr.	Blatt-Nr	AZ	Bemerkung
1	Titelblatt	R 17520	1		
2	Hinweisblatt	R 14500			
3	Beschreibung	R 17323	2...18		
4	"	R 17520	2		
5	"	R 17323	20...22		
6	"	R 17520	3		
7	"	R 17323	24...33		
8	"	R 17520	4		
9	"	R 17323	35...56		
10	"	R 17520	5...8		
11	"	R 17323	61...69		
12	Übers.-Liste	R 17323	70...79		
13	Zeichnungen	R 16008	74...83		
14	"	R 17542	9		
15	"	R 16008	85...88		
16	"	R 17542	10		
17	"	R 16008	90...100		
18	Beiblatt	R 17323	80		
19	Übers.-Liste	R 14000	1.. 10		
20	"	R 17323	81...84		
21	Schaltteilliste	414202 Sa	1	-	
22	"	"	2	-	
5 KWB	Name	Datum	Liste besteht aus 3 Blatt R 17645 Bl.1		
bearb.	Berger	18.8.69			
geschr.	Huber	23.8.69			
geprüft	Berger	1.9.69			

Pos.-Nr.	Teil	Sach.-Nr.	Blatt-Nr.	ÄZ	Bemerkung
23	Schaltteilliste	414202 Sa	3	-	
24	"	"	4	-	
25	"	"	5	-	
26	"	"	6	-	
27	"	"	7	-	
28	"	"	8	a	
29	"	"	9	a	
30	"	"	10	-	
31	"	"	11	-	
32	"	"	12	-	
33	Stromlauf	414202 S	1	-	
34	"	"	2	-	
35	Pos.-Plan	41420-3.10.1		b	
36	Schaltteilliste	41420-1.75 Sa		-	
37	Stromlauf	41420-1.75 S		a	
38	Pos.-Plan	41420-1.75.1		-	
39	Schalteilliste	41420-1.90.20 Sa	1	b	
40	"	"	2	-	
41	"	"	3	b	
42	Stromlauf	41420-1.90.20 S		a	
43	Pos.-Plan	41420-1.90.20		b	
44	Schaltteilliste	41420-50 Sa	1	d	
45	"	"	2	d	
46	Stromlauf	41420-50 S		d	
47	Pos.-Plan	41420-50		b	
48	Schaltteilliste	41420-51 Sa	1	b	
49	"	"	2	b	
50	"	"	3	-	
51	"	"	4	b	
52	Stromlauf	41420-51 S		b	
53	Pos.-Plan	41420-51		a	
54	Schaltteilliste	41420-52 Sa	1	a	
55	"	"	2	b	
56	"	"	3	a	
57	"	"	4	b	
58	Stromlauf	41420-52 S		b	
59	Pos.-Plan	41420-52		a	
60	Schaltteilliste	41420-53 Sa	1	b	
61	"	"	2	b	
62	"	"	3	b	
63	"	"	4	b	

R 17645 Bl.2

Pos.-Nr.	Teil	Sach.-Nr.	Blatt-Nr.	ÄZ	Bemerkung
64	Stromlauf	41420-53 S		c	
65	Pos.-Plan	41420-53		-	
66	Schaltteilliste	41422-1.76 Sa	1	c	
67	"	"	2	c	
68	"	"	3	a	
69	"	"	4	c	
70	Stromlauf	41422-1.76 S		c	
71	Pos.-Plan	41422-1.76		b	
72	Schaltteilliste	R 17542	11...18		
73	Stromlauf	R 17542	19		
74	Pos.-Plan	R 17542	20...21		
75	"	41422-10		-	
76	Schaltteilliste	41422-41 Sa	1	-	
77	"	"	2	a	
78	Stromlauf	41422-41 S		a	
79	Pos.-Plan	41422-41		a	
80	Schaltteilliste	41422-42 Sa	1	-	
81	"	"	2	a	
82	Stromlauf	41422-42 S		a	
83	Pos.-Plan	41422-42		a	
84	Schaltteilliste	41422-43 Sa	1	b	
85	"	"	2	a	
86	"	"	3	c	
87	Stromlauf	41422-43 S		c	
88	Pos.-Plan	41422-43		a	
89	Schaltteilliste	41422-44 Sa	1	-	
90	"	"	2	a	
91	Stromlauf	41422-44 S		b	
92	Pos.-Plan	41422-44		a	
93	Schaltteilliste	41422-45 Sa	1	-	
94	"	"	2	a	
95	Stromlauf	41422-45 S		b	
96	Pos.-Plan	41422-45		a	
97	Schaltteilliste	414222-20 Sa	1	-	
98	"	"	2	-	
99	"	"	3	-	
100	"	"	4	-	
101	Stromlauf	414222-20 S		-	
102	Pos.-Plan	414222-20		-	
103	Übers.-Liste	R 16660	1...10		
104	Schlüsselliste	R 7894	1...20		
105	Zus.-Vorschrift				
				R 17645 Bl3	

WELSH

The University

on the 1st of
the 1st of
the 1st of
the 1st of
the 1st of

and the 1st of
the 1st of
the 1st of
the 1st of
the 1st of

1
2
3
4
5
6
7
8
9
10

11

12
13
14